

## **SFP-TD96TG-80DC**

10.3Gbps SFP+ Tunable DWDM Transceiver, Single Mode, 80km Reach

### **Product Features**

- Supports 9.95Gb/s to 11.3Gb/s bit rates
- Monolithically integrated full C-band tunable transmitter and APD receiver
- 50 GHz ITU channel spacing with integrated wavelength locker
- Up to 80km for SMF transmission
- Compliant with SFP+ MSA with duplex LC receptacle
- Compliant with SFF-8472 and SFF-8690
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:  
Standard: -5 to +70°C

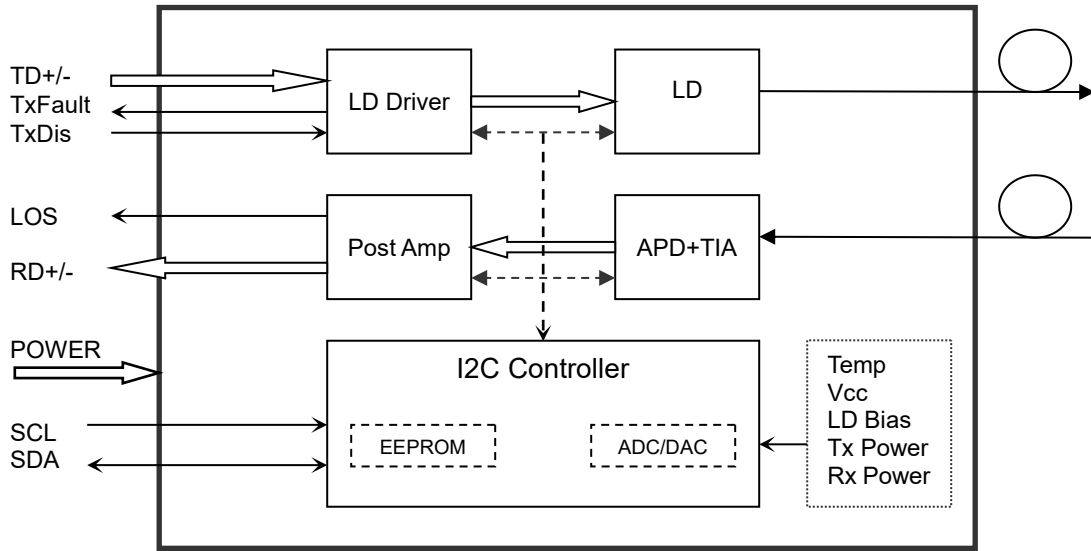
### **Applications**

- DWDM 10GBASE-ZR/ZW 10G Ethernet
- DWDM 80KM 10G Fiber Channel
- DWDM SONET OC-192&SDH STM-64

### **Description**

The SFP+ tunable transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates from 9.95 Gb/s to 11.3 Gb/s. The module complies with SFF-8431, SFF-8432, SFF-8690 and SFF 8472. It complies with the ITU-T G.698.1 standard with 50 GHz channel spacing for SONET/SDH, IEEE DWDM 10GBASE-ZR for 80 km reach (Ethernet), and DWDM 10GFC for 80 km reach (Fiber Channel) applications.

The transceiver contain a C-band-tunable integrated Mach-Zehnder (MZ) laser, enabling data transmission over single-mode fiber through an industry-standard LC connector. On the receiver side, the 10Gbps data stream is recovered from an APD/ trans-impedance amplifier, and passed to an output driver. This module features a hot-pluggable electrical interface.



Transceiver functional diagram

### Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.3	3.6	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

### Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Tc	-5		+70	°C
Power Supply Voltage	Vcc	3.135	3.30	3.465	V
Power Supply Current	Icc			500	mA
Data Rate			10.3		Gbps

## Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	As per ITU-T 694.1, 50GHz spacing 1529.16 to 1563.86			nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	
Average Output Power	$P_{out}$	-1		+3	dBm	1
Extinction Ratio	ER	8.2			dB	
Frequency stability (BOL)		$f_c - 1.5$		$f_c + 1.5$	GHz	
Frequency stability (EOL)		$f_c - 2.5$		$f_c + 2.5$	GHz	
Data Input Swing Differential	$V_{IN}$	240		810	mV	2
Input Differential Impedance	$Z_{IN}$	90	100	110	$\Omega$	
TX Disable	Disable	2.0		$V_{cc}$	V	
	Enable	0		0.8	V	
TX Fault	Fault	2.0		$V_{cc}$	V	
	Normal	0		0.8	V	
<b>Receiver</b>						
Centre Wavelength	$\lambda_c$	1480		1580	nm	
Rx Sensitivity with dispersion 0 ps/nm				-23	dBm	@9.95, 10.3, 10.5Gbps, BER $\leq$ 1E-12
				-27		@10.7Gbps, BER $\leq$ 1E-4
				-27		@11.1Gbps, BER $\leq$ 1E-4
				-26.5		@11.3Gbps, BER $\leq$ 1E-4
Rx Sensitivity with dispersion - 400 to +1450 ps/nm				-21	dBm	@9.95, 10.3, 10.5Gbps, BER $\leq$ 1E-12
				-25		@10.7Gbps, BER $\leq$ 1E-4
				-25		@11.1Gbps, BER $\leq$ 1E-4
				-24		@11.3Gbps, BER $\leq$ 1E-4
Receiver Overload		-7			dBm	

LOS De-Assert	LOS <sub>D</sub>			-27	dBm	
LOS Assert	LOS <sub>A</sub>	-36			dBm	
LOS Hysteresis		0.5			dB	
Data Output Swing Differential	V <sub>out</sub>	350		800	mV	3
LOS	High	2.0		V <sub>cc</sub>	V	
	Low			0.8	V	

**Notes:**

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Internally AC-coupled.

## Timing and Electrical

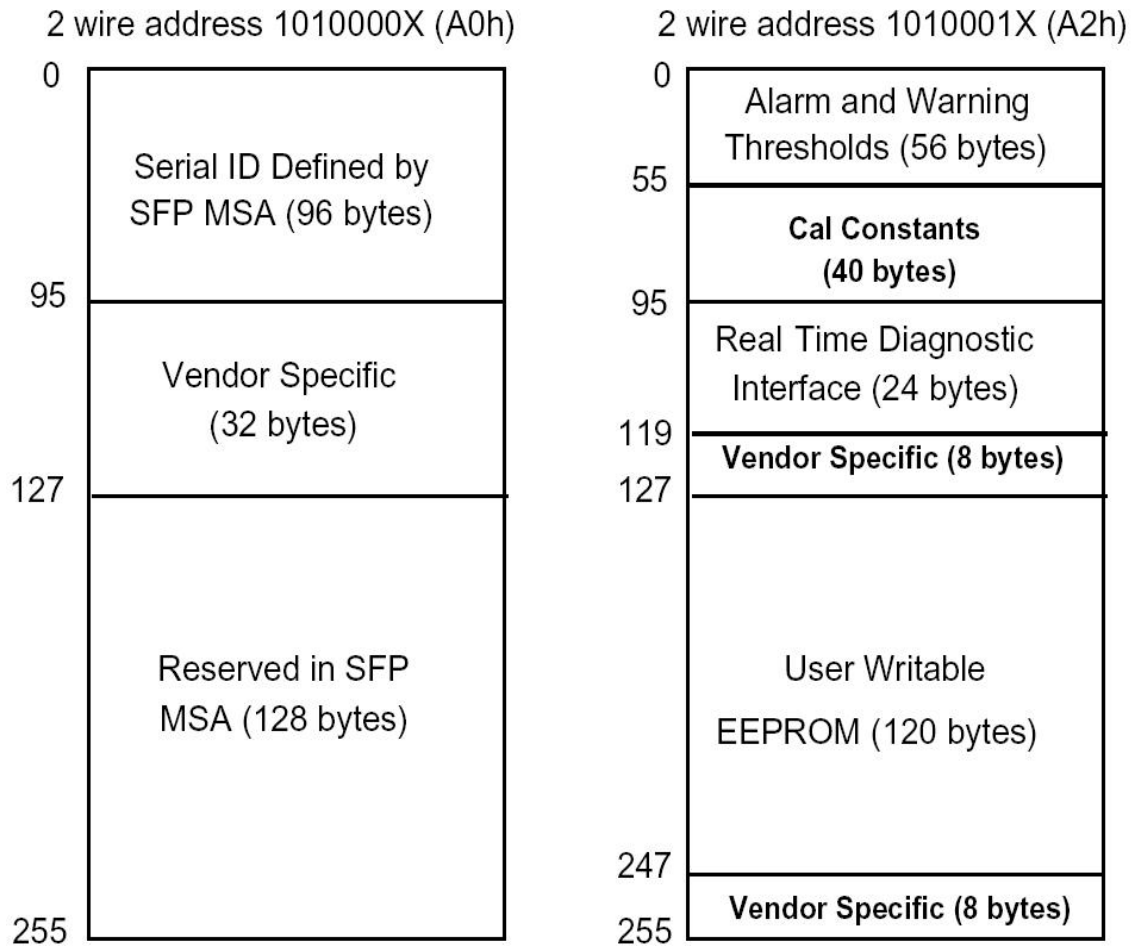
Parameter	Symbol	Min	Typical	Max	Unit
Time to initialize cooled module	T <sub>start_up</sub>			20	s
Channel Switch time	T <sub>channelSwitch</sub>			200	ms

## Digital Diagnostic Memory Map

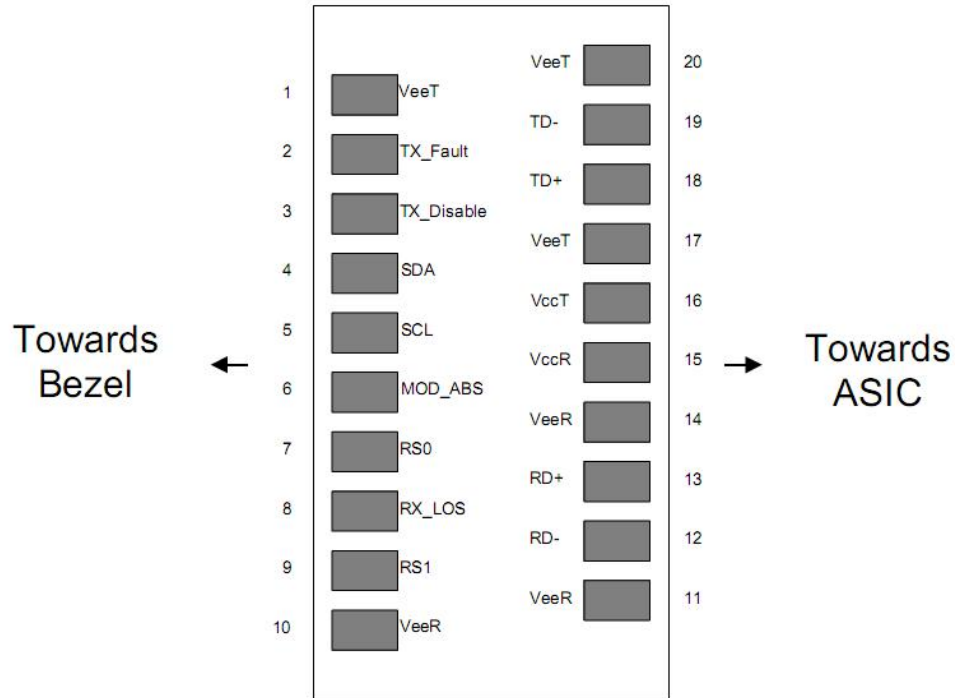
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## Pin Descriptions



Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	RS1	Not Connected	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5

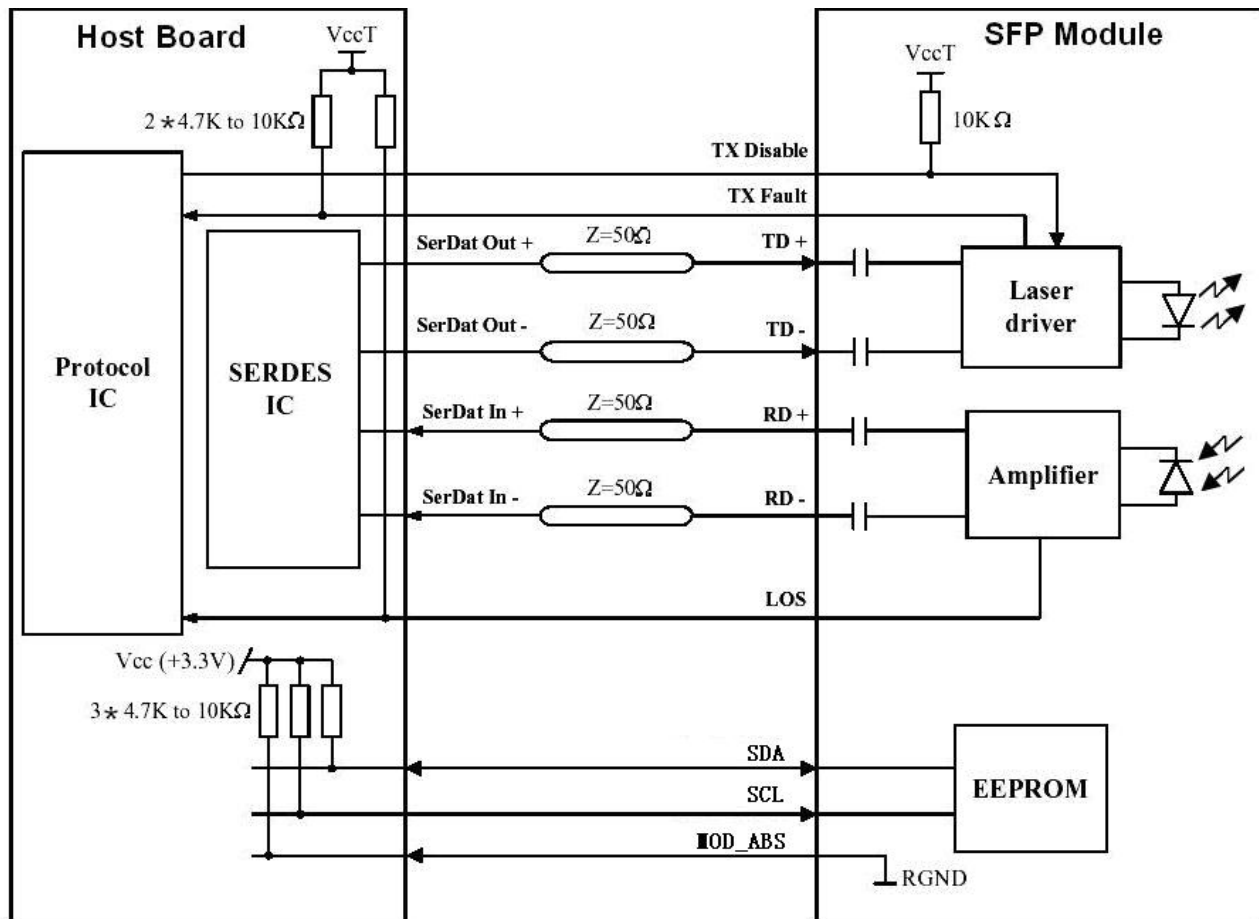
19	TD-	Inv. Transmit Data In	3	Note 5
20	V <sub>EET</sub>	Transmitter Ground	1	

**Notes:**

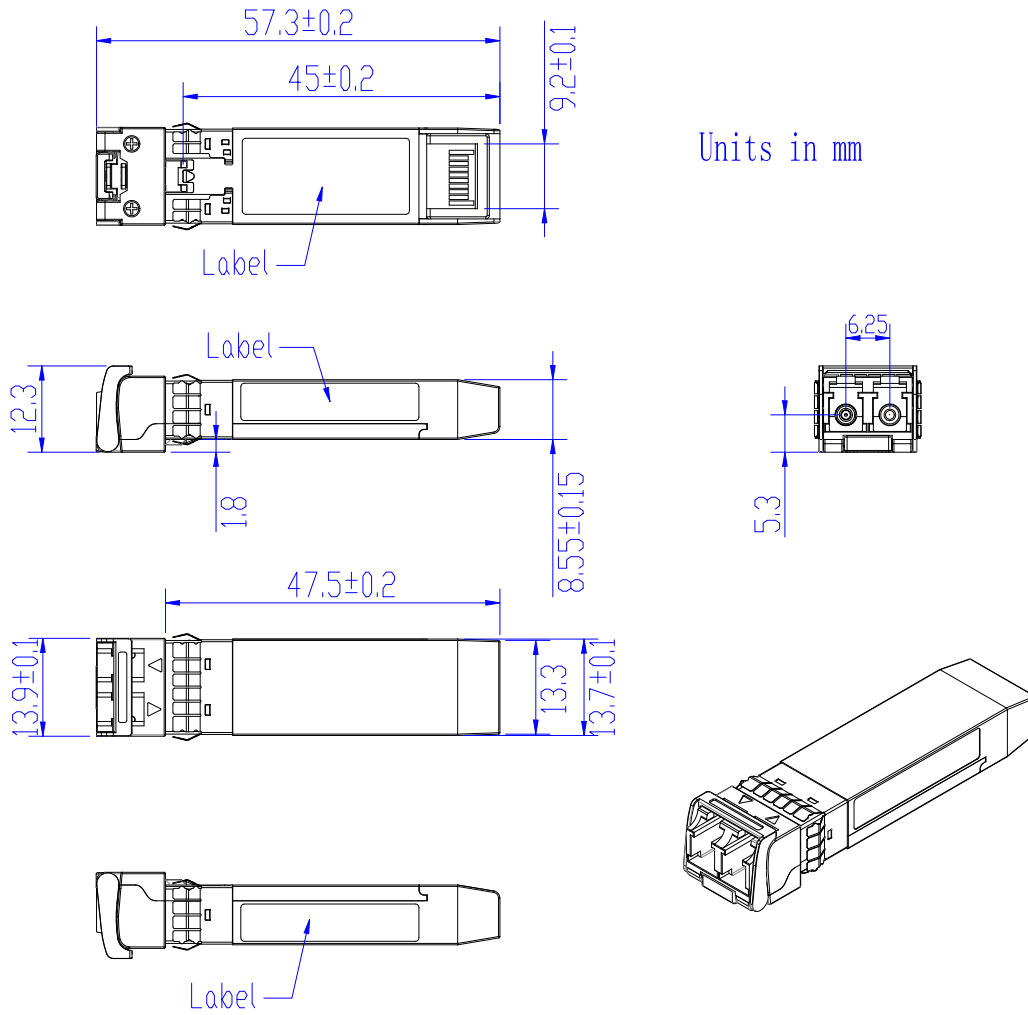
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 4) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 5) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

**Recommended Interface Circuit**



## Mechanical Dimensions





## Ordering information

Part Number	Product Description
SFP-TD96TG-80DC	1529.16 to 1563.86nm tunable DWDM, 10Gbps, LC, 80km, 0°C~+70°C, with DDM

λC Wavelength Guide					
ITU Channel	Wavelength	Frequency(THz)	ITU Channel	Wavelength	Frequency(THz)
1	1568.36	191.15	51	1548.11	193.65
2	1567.95	191.20	52	1547.72	193.70
3	1567.54	191.25	53	1547.32	193.75
4	1567.13	191.30	54	1546.92	193.80
5	1566.72	191.35	55	1546.52	193.85
6	1566.31	191.40	56	1546.12	193.90
7	1565.90	191.45	57	1545.72	193.95
8	1565.50	191.50	58	1545.32	194.00
9	1565.09	191.55	59	1544.92	194.05
10	1564.68	191.60	60	1544.53	194.10
11	1564.27	191.65	61	1544.13	194.15
12	1563.86	191.70	62	1543.73	194.20
13	1563.45	191.75	63	1543.33	194.25
14	1563.05	191.80	64	1542.94	194.30
15	1562.64	191.85	65	1542.54	194.35
16	1562.23	191.90	66	1542.14	194.40
17	1561.83	191.95	67	1541.75	194.45
18	1561.42	192.00	68	1541.35	194.50
19	1561.01	192.05	69	1540.95	194.55
20	1560.61	192.10	70	1540.56	194.60
21	1560.20	192.15	71	1540.16	194.65
22	1559.79	192.20	72	1539.77	194.70
23	1559.39	192.25	73	1539.37	194.75
24	1558.98	192.30	74	1538.98	194.80
25	1558.58	192.35	75	1538.58	194.85
26	1558.17	192.40	76	1538.19	194.90
27	1557.77	192.45	77	1537.79	194.95
28	1557.36	192.50	78	1537.40	195.00
29	1556.96	192.55	79	1537.00	195.05
30	1556.55	192.60	80	1536.61	195.10

31	1556.15	192.65	81	1536.22	195.15
32	1555.75	192.70	82	1535.82	195.20
33	1555.34	192.75	83	1535.43	195.25
34	1554.94	192.80	84	1535.04	195.30
35	1554.54	192.85	85	1534.64	195.35
36	1554.13	192.90	86	1534.25	195.40
37	1553.73	192.95	87	1533.86	195.45
38	1553.33	193.00	88	1533.47	195.50
39	1552.93	193.05	89	1533.07	195.55
40	1552.52	193.10	90	1532.68	195.60
41	1552.12	193.15	91	1532.29	195.65
42	1551.72	193.20	92	1531.90	195.70
43	1551.32	193.25	93	1531.51	195.75
44	1550.92	193.30	94	1531.12	195.80
45	1550.52	193.35	95	1530.72	195.85
46	1550.12	193.40	96	1530.33	195.90
47	1549.72	193.45	97	1529.94	195.95
48	1549.32	193.50	98	1529.55	196.00
49	1548.91	193.55	99	1529.16	196.05
50	1548.51	193.60			

## For More Information

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