

T510M & T51EM Series

10Gb/s 1550nm Electro-absorption Modulated Lasers (EML) TOSA

9 Pin Package with optional FPC flex circuit

40km and 80km (IR2 and LR2) Service

Commercial and Industrial Operating Temperatures



The Multiplex T510 & T51E series EML TOSA module consists of a multi-quantum-well laser and a monolithically integrated electro-absorption (EA) modulator in a hermetically sealed metalized ceramic package. State-of-the-art, epoxy-free laser welding is utilized. The laser module also contains a thermoelectric cooler and a monitor photodiode.

The T510M & T51EM series modules are optimized to operate at a bit-rate of 9.95328Gb/s transmission. It's designed to be fully compliant with Telcordia GR-253-CORE OC-192 IR-2 and LR-2 for intermediate and long reach applications up to 40km and 80km respectively. The modules use a high performance EML platform operating at 1550nm, where fiber loss is at a minimum. Careful control of the output signal for minimum "chirp" allows the modules to provide superior performance and reach with standard single mode fiber.

An incorporated thermoelectric cooler keeps the laser chip at a well-controlled temperature. This allows the device to operate over a case temperature range of -5°C to +80°C (or -40°C to +85°C for the extended temperature version).

The T510M & T51EM come with a receptacle connector. Other connector types may be specified as options.

Applications:

- T510M & T51EM series is designed for high-speed telecom and datacom transmissions over spans up to 80km in length in compliance with Telcordia GR-253-CORE (issue 3) LR-2 specifications.

Features:

- TOSA package with industry standard FPC flex circuit and LC-type receptacle connector
- Available for C-band ITU Channels 13 through 60 on 50GHz and 100GHz spacing.
- Extended temperature -40°C to +85°C option available.
- High-speed design optimized for modulation at 9.95328Gb/s.
- 50 ohm input impedance match.
- Integrated optical isolator.

Compliance:

- Conforms to the requirements of the European Union Directive 2002/95/EC for the Restriction of Hazardous Substance (RoHS)

T510M & T51EM Series

Optical and Electrical Characteristics						
PARAMETER	SYMBOL	CONDITION	MIN	TYP.	MAX	UNIT
DFB Laser:						
Set temperature for laser operation	T _{set}	Temperature set for TEC	35		45	°C
Threshold current	I _{th}	At T _{set} , CW operation	5		20	mA
Operating current	I _{op}	At T _{set} , BOL	40	70	100	mA
		At T _{set} , EOL	60		150	mA
Laser forward bias voltage	V _{op}	At T _{set} , I _{op}	1	1.3	2	V
Peak wavelength	λ _o	At T _{set} , I _{op} , and 9.95328Gb/s, 2 ³¹ - 1 PRBS NRZ modulated	1529.16		1567.13	nm
			See Page 5.			
Side mode suppression ratio	SMSR	At 9.95328Gb/s, 2 ³¹ - 1 PRBS NRZ modulated	35	45	-	dB
Peak Wavelength stability		APC operation 20 yrs and over case temperature	-0.08		+0.08	nm
Wavelength stability over temperature	dλ _o /dT _c	Change with case temperature -40°C to +85°C	-0.5	-0.3	+0.5	pm/°C
EA Modulator:						
Mark offset voltage	V _{mark}	On-level modulator voltage	-1		-0.01	V
Peak-to-peak RF drive voltage	V _{pp}	To meet ER, P _p , P _{mod} , etc.		2		V
Input Impedance	Z _{in}		45	50	55	Ω
Module:						
RF Dynamic Extinction ratio	Er	At 9.95328 Gb/s, 2 ³¹ - 1 PRBS NRZ modulated V _{mark} biased, modulated with V _{pp}	9.0		-	dB
Monitor photodiode current	I _{pd}	At T _{set} , I _{op}	0.05		1.5	mA
Monitor Dark current	I _d	V _{bias} = -5V			0.1	μA
Modulated fiber output	P _{mod}	At 9.95328 Gb/s, 2 ³¹ - 1 PRBS NRZ modulated 80km 40km	0 -1		4 2	dBm
Optical isolation	-	From output fiber to device, module at T _{set}	30		-	dB
Case temperature	T _{case}	Operating case temperature	-5		80	°C
Transmission penalty due to dispersion	P _p	80km at 9.95328 Gb/s, 2 ³¹ - 1 PRBS NRZ modulated, 1600 ps/nm dispersion. BER = 10 ⁻¹²	-		2	dB
		40km at 9.95328 Gb/s, 2 ³¹ - 1 PRBS NRZ modulated, 800 ps/nm dispersion. BER = 10 ⁻¹²	-		2	
TEC thermal capacity ³	ΔTEC	At T _{set} , I _{op} ΔTEC = T _{case} – T _{set} Standard Temperature Extended Temperature	-50 -85		45 55	°C

T510M & T51EM Series

TEC current	I _{tec}	At T _{set} , I _{op} EOL Standard Temperature Extended Temperature	-		0.5 0.7	A
TEC voltage	V _{tec}	At T _{set} , I _{op} EOL Standard Temperature Extended Temperature	-		2.5 2.8	V
TEC AC resistance	R _{tec}	At T _{set} , I _{op} EOL			3	Ohm
TEC power dissipation	P _{tec}	At T _{set} , I _{op} EOL Standard Temperature Extended Temperature			0.8 1.0	W
Thermistor Resistance	R _{th}	At 25 °C	9.5	10.0	10.5	kΩ
Thermistor B Constant			3800	3900	4000	
Connector Type		LC Receptacle				
Lead Soldering time	t	Soldering temperature 260 °C,			10	s

Table Notes: 1. V_{mark} is the top rail DC voltage applied to the modulator.
2. All modules are tested to pass the SONET OC-192 eye-mask criteria.
3. Optimal thermal contact between the TOSA housing and the application heat-sink is required.

Absolute Maximum Operating Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device.
Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

PARAMETER	SYMBOL	CONDITION	MIN	MAX	UNIT
Laser Diode Reverse Voltage	V _{RL}	CW	-	2	V
Laser Diode Forward Current	I _{FL}	CW	-	150	mA
Optical Output Power	P	CW	-	10	mW
Laser Chip Temperature	T _{LD}		30	50	°C
Modulator Reverse Voltage	V _{MR}		-	5	V
Modulator Forward Voltage	V _{MF}		-	1	V
Photodiode Reverse Voltage	V _{RPD}		-	10	V
Photodiode Forward Current	I _{FPD}		-	1	mA
Thermoelectric Cooler Current	I _{TEC}		-0.9	0.9	A
Thermoelectric Cooler Voltage	V _{TEC}		-2.8	2.8	V
Thermistor Voltage	V _{Th}		-	5	V
Thermistor Current	I _{Th}		-	2	mA
Operating Case Temperature Range ¹	T _{Opr}	Standard Temperature Extended Temperature	-10 -45	+85 +95	°C
Storage Case Temperature Range	T _{stg}		-40	+85	°C

Table Notes: 1. Optimal thermal contact between the TOSA housing and the application heat-sink is required.

Ordering information:

T51	X	M	X	XX	X	X	0
	Temp Range: 0= -5°C to + 80°C E= -40°C to +85°C	Data Rate: M= 9.9538Gb/s	Wavelength: A= Fixed λ , C channel. B= Fixed λ , H channel. Omitted for Non-ITU	ITU channel: XX=ITU xx channel Omitted for Non-ITU	Connector: M=Receptacle (LA). P= Receptacle (SC). R=Receptacle (LC). S=Pigtail SC. F=Pigtail FC. L=Pigtail LC. A=Pigtail SA-APC. B=Pigtail FA-APC. C=Pigtail LC-APC. M=Pigtail MU.	Reach: L=40km L=80km	Customized Information: 0= Bare Lead 6 = FPC type See note #1

Note #1 - Details of FPC types can be obtained by contacting Multiplex. Custom FPC types are available upon request.

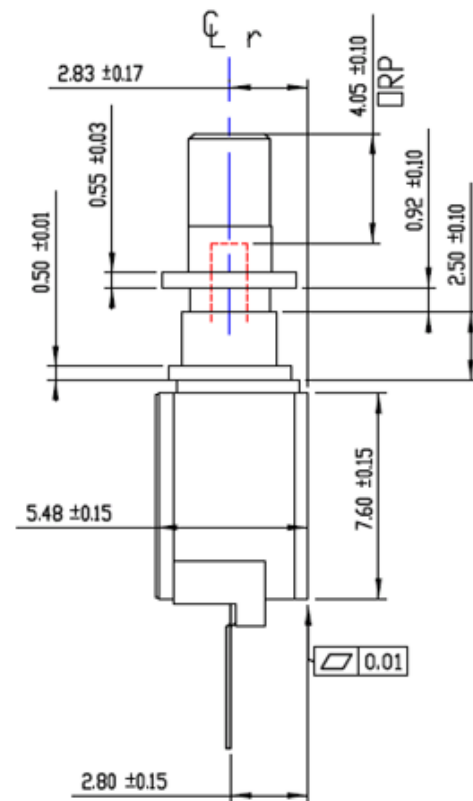
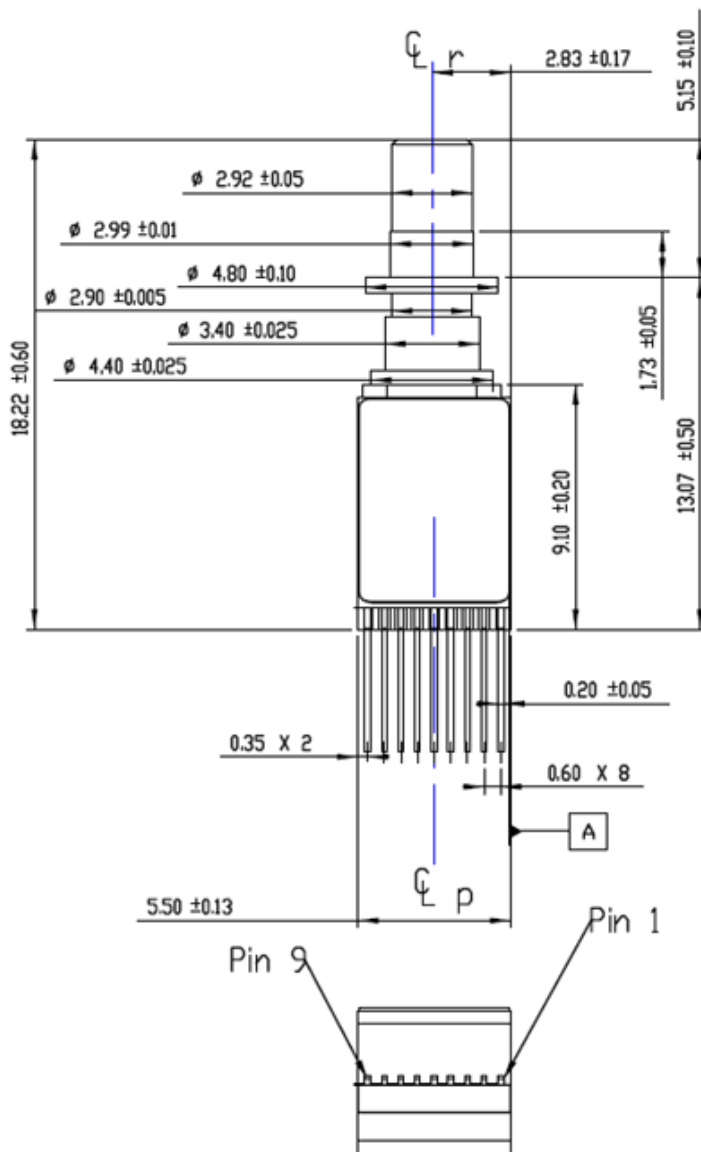
E.g. T510MA33RL0 has an operating range of -5°C to + 80°C, 1550nm C band, ITU Channel 33, 9.95328Gb/s 80Km application, LC Receptacle with bare-lead package.

ITU Grid Wavelengths, Frequencies, Channels and ordering codes

Note – actual ordering codes may change depending on the device configuration selected as per the table on page 4.

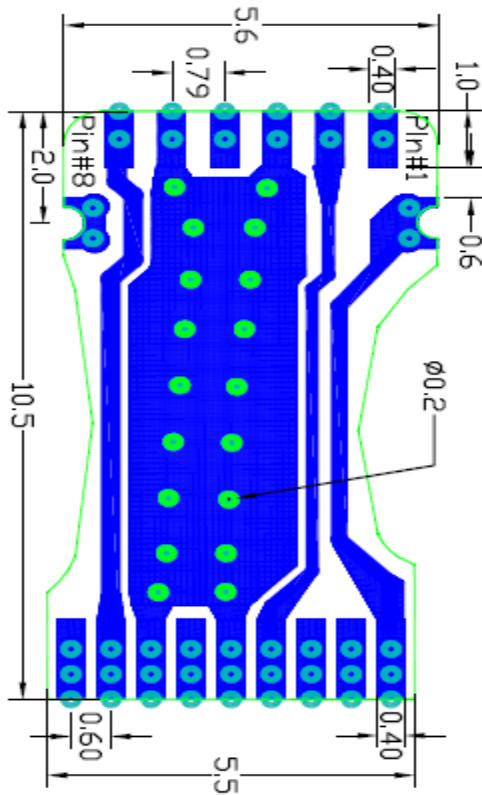
Channel	Wavelength (nm)	Frequency (THz)	Code		Channel	Wavelength (nm)	Frequency (THz)	Code
H60	1529.16	196.05	T510MB60RL0		C36	1548.51	193.60	T510MA36RL0
C60	1529.55	196.00	T510MA60RL0		H35	1548.91	193.55	T510MB35RL0
H59	1529.94	195.95	T510MB59RL0		C35	1549.32	193.50	T510MA35RL0
C59	1530.33	195.90	T510MA59RL0		H34	1549.72	193.45	T510MB34RL0
H58	1530.72	195.85	T510MB58RL0		C34	1550.12	193.40	T510MA34RL0
C58	1531.12	195.80	T510MA58RL0		H33	1550.52	193.35	T510MB33RL0
H57	1531.51	195.75	T510MB57RL0		C33	1550.92	193.30	T510MA33RL0
C57	1531.90	195.70	T510MA57RL0		H32	1551.32	193.25	T510MB32RL0
H56	1532.29	195.65	T510MB56RL0		C32	1551.72	193.20	T510MA32RL0
C56	1532.68	195.60	T510MA56RL0		H31	1552.12	193.15	T510MB31RL0
H55	1533.07	195.55	T510MB55RL0		C31	1552.52	193.10	T510MA31RL0
C55	1533.47	195.50	T510MA55RL0		H30	1552.93	193.05	T510MB30RL0
H54	1533.86	195.45	T510MB54RL0		C30	1553.33	193.00	T510MA30RL0
C54	1534.25	195.40	T510MA54RL0		H29	1553.73	192.95	T510MB29RL0
H53	1534.64	195.35	T510MB53RL0		C29	1554.13	192.90	T510MA29RL0
C53	1535.04	195.30	T510MA53RL0		H28	1554.54	192.85	T510MB28RL0
H52	1535.43	195.25	T510MB52RL0		C28	1554.94	192.80	T510MA28RL0
C52	1535.82	195.20	T510MA52RL0		H27	1555.34	192.75	T510MB27RL0
H51	1536.22	195.15	T510MB51RL0		C27	1555.75	192.70	T510MA27RL0
C51	1536.61	195.10	T510MA51RL0		H26	1556.15	192.65	T510MB26RL0
H50	1537.00	195.05	T510MB50RL0		C26	1556.55	192.60	T510MA26RL0
C50	1537.40	195.00	T510MA50RL0		H25	1556.96	192.55	T510MB25RL0
H49	1537.79	194.95	T510MB49RL0		C25	1557.36	192.50	T510MA25RL0
C49	1538.19	194.90	T510MA49RL0		H24	1557.77	192.45	T510MB24RL0
H48	1538.58	194.85	T510MB48RL0		C24	1558.17	192.40	T510MA24RL0
C48	1538.98	194.80	T510MA48RL0		H23	1558.58	192.35	T510MB23RL0
H47	1539.37	194.75	T510MB47RL0		C23	1558.98	192.30	T510MA23RL0
C47	1539.77	194.70	T510MA47RL0		H22	1559.39	192.25	T510MB22RL0
H46	1540.16	194.65	T510MB46RL0		C22	1559.79	192.20	T510MA22RL0
C46	1440.56	194.60	T510MA46RL0		H21	1560.20	192.15	T510MB21RL0
H45	1540.95	194.55	T510MB45RL0		C21	1560.61	192.10	T510MA21RL0
C45	1541.35	194.50	T510MA45RL0		H20	1561.01	192.05	T510MB20RL0
H44	1541.75	194.45	T510MB44RL0		C20	1561.42	192.00	T510MA20RL0
C44	1542.14	194.40	T510MA44RL0		H19	1561.83	191.95	T510MB19RL0
H43	1542.54	194.35	T510MB43RL0		C19	1562.23	191.90	T510MA19RL0
C43	1542.94	194.30	T510MA43RL0		H18	1562.64	191.85	T510MB18RL0
H42	1543.33	194.25	T510MB42RL0		C18	1563.05	191.80	T510MA18RL0
C42	1543.73	194.20	T510MA42RL0		H17	1563.45	191.75	T510MB17RL0
H41	1544.13	194.15	T510MB41RL0		C17	1563.86	191.70	T510MA17RL0
C41	1544.53	194.10	T510MA41RL0		H16	1564.27	191.65	T510MB16RL0
H40	1544.92	194.05	T510MB40RL0		C16	1564.68	191.60	T510MA16RL0
C40	1545.32	194.00	T510MA40RL0		H15	1565.09	191.55	T510MB15RL0
H39	1545.72	193.95	T510MB39RL0		C15	1565.50	191.50	T510MA15RL0
C39	1546.12	193.90	T510MA39RL0		H14	1565.90	191.45	T510MB14RL0
H38	1546.12	193.85	T510MB38RL0		C14	1566.31	191.40	T510MA14RL0
C38	1546.92	193.80	T510MA38RL0		H13	1566.72	191.35	T510MB13RL0
H37	1547.32	193.75	T510MB37RL0		C13	1567.13	191.30	T510MA13RL0
C37	1547.72	193.70	T510MA37RL0		Non-ITU	1529.16 – 1567.13		T510MRI0
H36	1548.11	193.65	T510MB36RL0					

T510M & T51EM Series



Pin Configuration

Pin Number	Description
1	Thermoelectric Cooler (-)
2	Thermoelectric Cooler (+)
3	Ground
4	Modulator RF in
5	Ground
6	Back Facet Monitor
7	Laser Anode
8	Not Connected
9	Thermistor



Pin Configuration

Pin Number	Description
1	Thermoelectric Cooler (-)
2	Thermoelectric Cooler (+)
3	Ground
4	Modulator RF in
5	Ground
6	Back Facet Monitor
7	Laser Anode
8	Thermistor

FPC Type 6 is shown for illustrative purposes.

WARRANTY

Multiplex warrants all standard laser products, when used within the operating limits, against defects in material and workmanship for a period of one year from date of shipment.

QUALITY

Multiplex is qualified to International Standard ISO 9001:2008.



Multiplex, Inc.

Photonics for Communications

Multiplex, Inc.

5000 Hadley Road

South Plainfield, NJ 07080 USA

Tel: 908.757.8817 Fax: 908.769.4288

www.multiplexinc.com