Multiplex, Inc.
Photonics for Communications

T510G & T51EG Series

2.67Gb/s 1550nm Electro-absorption Modulated Lasers (EML) TOSA
9 Pin Package with optional FPC flex circuit
80km, 120km and 200km (LR-2, VR-2 and UR-3) 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 T510G & T51EG series modules are optimized to operate at bit-rates of 2.67Gbps transmission. It's designed to be fully compliant with Telcordia GR-253-CORE OC-48 LR-2, VR-2 and UR-3 for long, very long and ultra long applications up to 80km, 120km and 200km 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 T510G & T51EG come with a receptacle connector. Other connector types may be specified as options.

Applications:

- T510G & T51EG series is designed for high-speed telecom and datacom transmissions over spans up to 200km in length in compliance with Telcordia GR-253-CORE (issue 3) UR-3 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 2.67Gbps.
- 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)

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	Vop	At T_{set}, I_{op}	1	1.3	2	V
Peak wavelength	λo	At T_{set}, $I_{op,}$ and 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated	1529.16		1567.13	nm
			See Page 5.			
Side mode suppression ratio	SMSR	At 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated	35	45	-	dB
Peak Wavelength stability		APC operation 20 years and over case temperature	-0.08		+0.08	nm
Wavelength stability over temperature	dλo/dTc	Change with case temperature -40 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, Pp, Pmod, etc.		2		V
Input Impedance	Z_{in}		45	50	55	Ω
Module:						
RF Dynamic Extinction ratio	Er	At 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated V_{mark} biased, modulated with V_{pp}	8.2		-	dB
Monitor photodiode current	I_{pd}	At T_{set}, I_{op}	0.05		1.5	mA
Monitor Dark current	I_d	Vbias = -5V			0.1	μA
Modulated fiber output	P_{mod}	At 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated 80km 120km 200km	 0 0 3		 3 3 5	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	Pp	80km at 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated, 1600 ps/nm dispersion. BER = 10^{-10}	-		2	dB
		120km at 2.67 Gb/s, 2^{31} - 1 PRBS NRZ modulated, 2400 ps/nm dispersion. BER = 10^{-10}	-		3	
		200km at 2.67Gb/s, 2^{31} - 1 PRBS NRZ modulated, 4000 ps/nm dispersion. BER = 10^{-10}	-		4	
TEC thermal capacity[3]	ΔTEC	At T_{set}, I_{op} ΔTEC = Tcase – Tset Standard Temperature Extended Temperature	 -50 -85	 45 55		°C

TEC current	Itec	At T_{set}, I_{op} EOL Standard Temperature Extended Temperature	-		0.5 0.7	A
TEC voltage	Vtec	At T_{set}, I_{op} EOL Standard Temperature Extended Temperature	-		2.5 2.8	V
TEC AC resistance	Rtec	At T_{set}, I_{op} EOL			3	Ohm
TEC power dissipation	Ptec	At T_{set}, I_{op} EOL Standard Temperature Extended Temperature			0.8 1.0	W
Thermistor Resistance	Rth	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. Vmark is the top rail DC voltage applied to the modulator.
2. All modules are tested to pass the SONET OC-48 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}		-	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	G	X	XX	X	X	0
	Temp Range: 0= -5°C to + 80°C E= -40°C to +85°C	**Data Rate:** G= 2.67Gb/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=80km V=120km U=200km	**Customized Information:** 0= Bare Lead 6 = FPC type See note #1

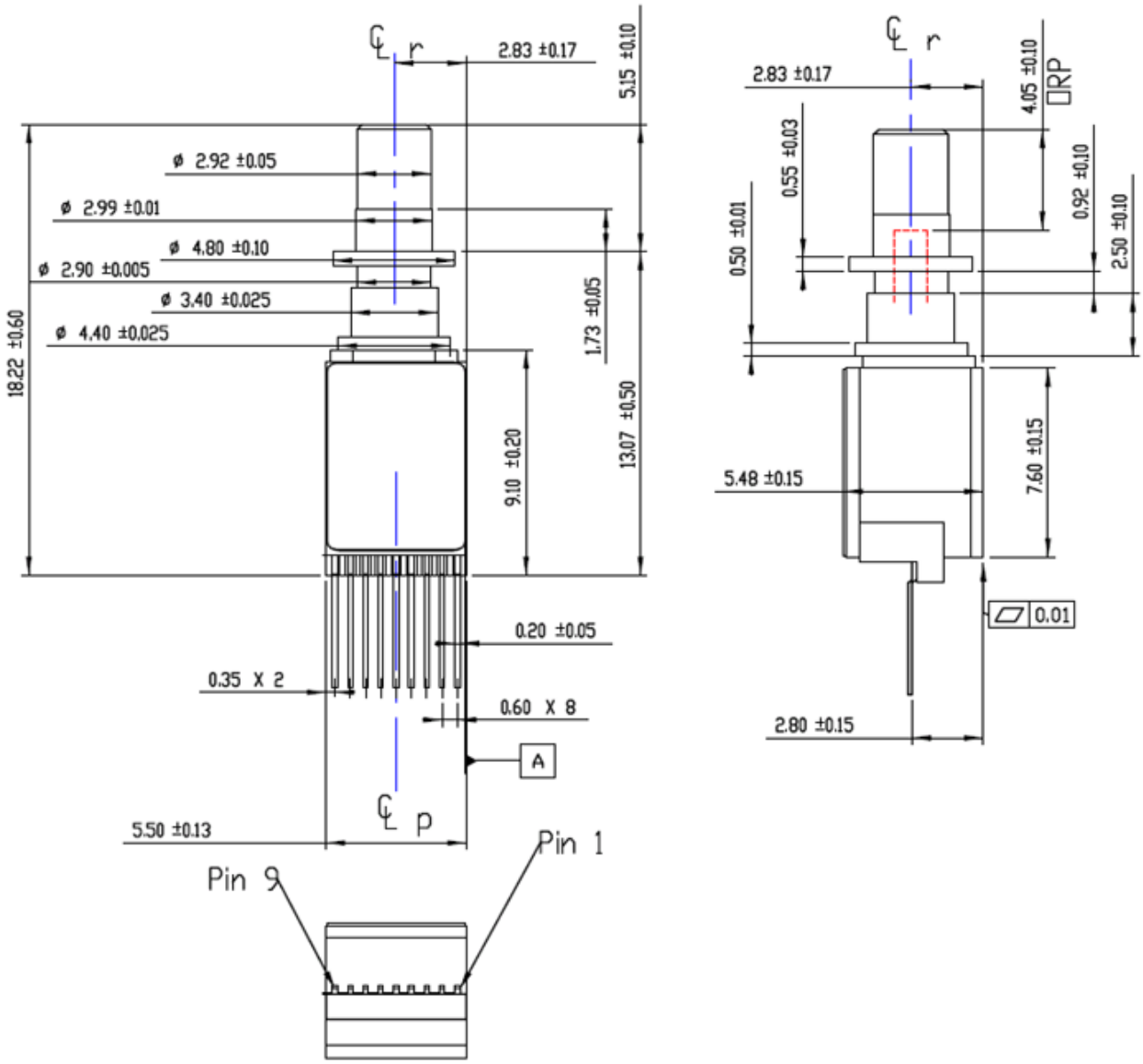
Note #1 - Details of FPC types can be obtained by contacting Multiplex. Custom FPC types are available upon request.

E.g. T510GA33RL0 has an operating range of -5°C to + 80°C, 1550nm C band, ITU Channel 33, 2.67Gb/s 80km application, LC Receptacle with bare-lead package.

ITU Grid Wavelengths, Frequencies, Channels and ordering codes

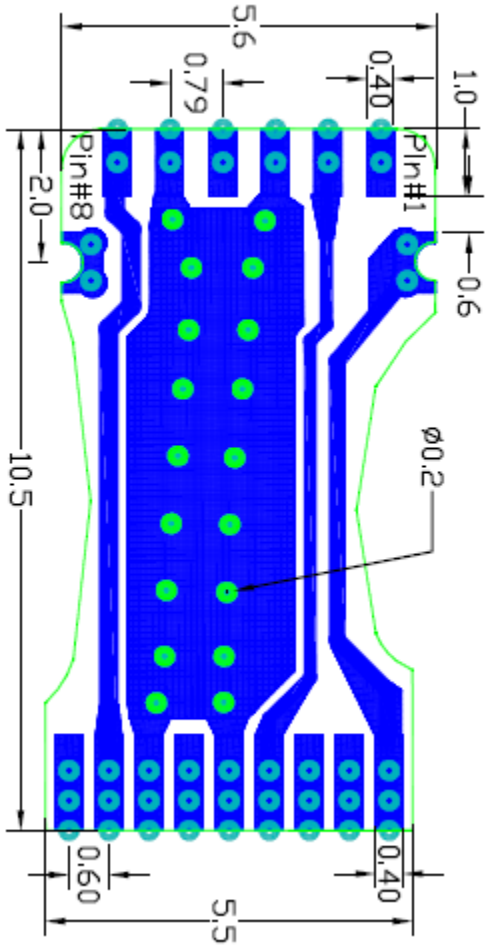
Note – actual ordering codes may change depending on the device configuration selected as per the table on page 4.

Channel	Wavelength (nm)	Frequency (THZ)	Code		Channel	Wavelength (nm)	Frequency (THz)	Code
H60	1529.16	196.05	T510GB60RL0		C36	1548.51	193.60	T510GA36RL0
C60	1529.55	196.00	T510GA60RL0		H35	1548.91	193.55	T510GB35RL0
H59	1529.94	195.95	T510GB59RL0		C35	1549.32	193.50	T510GA35RL0
C59	1530.33	195.90	T510GA59RL0		H34	1549.72	193.45	T510GB34RL0
H58	1530.72	195.85	T510GB58RL0		C34	1550.12	193.40	T510GA34RL0
C58	1531.12	195.80	T510GA58RL0		H33	1550.52	193.35	T510GB33RL0
H57	1531.51	195.75	T510GB57RL0		C33	1550.92	193.30	T510GA33RL0
C57	1531.90	195.70	T510GA57RL0		H32	1551.32	193.25	T510GB32RL0
H56	1532.29	195.65	T510GB56RL0		C32	1551.72	193.20	T510GA32RL0
C56	1532.68	195.60	T510GA56RL0		H31	1552.12	193.15	T510GB31RL0
H55	1533.07	195.55	T510GB55RL0		C31	1552.52	193.10	T510GA31RL0
C55	1533.47	195.50	T510GA55RL0		H30	1552.93	193.05	T510GB30RL0
H54	1533.86	195.45	T510GB54RL0		C30	1553.33	193.00	T510GA30RL0
C54	1534.25	195.40	T510GA54RL0		H29	1553.73	192.95	T510GB29RL0
H53	1534.64	195.35	T510GB53RL0		C29	1554.13	192.90	T510GA29RL0
C53	1535.04	195.30	T510GA53RL0		H28	1554.54	192.85	T510GB28RL0
H52	1535.43	195.25	T510GB52RL0		C28	1554.94	192.80	T510GA28RL0
C52	1535.82	195.20	T510GA52RL0		H27	1555.34	192.75	T510GB27RL0
H51	1536.22	195.15	T510GB51RL0		C27	1555.75	192.70	T510GA27RL0
C51	1536.61	195.10	T510GA51RL0		H26	1556.15	192.65	T510GB26RL0
H50	1537.00	195.05	T510GB50RL0		C26	1556.55	192.60	T510GA26RL0
C50	1537.40	195.00	T510GA50RL0		H25	1556.96	192.55	T510GB25RL0
H49	1537.79	194.95	T510GB49RL0		C25	1557.36	192.50	T510GA25RL0
C49	1538.19	194.90	T510GA49RL0		H24	1557.77	192.45	T510GB24RL0
H48	1538.58	194.85	T510GB48RL0		C24	1558.17	192.40	T510GA24RL0
C48	1538.98	194.80	T510GA48RL0		H23	1558.58	192.35	T510GB23RL0
H47	1539.37	194.75	T510GB47RL0		C23	1558.98	192.30	T510GA23RL0
C47	1539.77	194.70	T510GA47RL0		H22	1559.39	192.25	T510GB22RL0
H46	1540.16	194.65	T510GB46RL0		C22	1559.79	192.20	T510GA22RL0
C46	1440.56	194.60	T510GA46RL0		H21	1560.20	192.15	T510GB21RL0
H45	1540.95	194.55	T510GB45RL0		C21	1560.61	192.10	T510GA21RL0
C45	1541.35	194.50	T510GA45RL0		H20	1561.01	192.05	T510GB20RL0
H44	1541.75	194.45	T510GB44RL0		C20	1561.42	192.00	T510GA20RL0
C44	1542.14	194.40	T510GA44RL0		H19	1561.83	191.95	T510GB19RL0
H43	1542.54	194.35	T510GB43RL0		C19	1562.23	191.90	T510GA19RL0
C43	1542.94	194.30	T510GA43RL0		H18	1562.64	191.85	T510GB18RL0
H42	1543.33	194.25	T510GB42RL0		C18	1563.05	191.80	T510GA18RL0
C42	1543.73	194.20	T510GA42RL0		H17	1563.45	191.75	T510GB17RL0
H41	1544.13	194.15	T510GB41RL0		C17	1563.86	191.70	T510GA17RL0
C41	1544.53	194.10	T510GA41RL0		H16	1564.27	191.65	T510GB16RL0
H40	1544.92	194.05	T510GB40RL0		C16	1564.68	191.60	T510GA16RL0
C40	1545.32	194.00	T510GA40RL0		H15	1565.09	191.55	T510GB15RL0
H39	1545.72	193.95	T510GB39RL0		C15	1565.50	191.50	T510GA15RL0
C39	1546.12	193.90	T510GA39RL0		H14	1565.90	191.45	T510GB14RL0
H38	1546.12	193.85	T510GB38RL0		C14	1566.31	191.40	T510GA14RL0
C38	1546.92	193.80	T510GA38RL0		H13	1566.72	191.35	T510GB13RL0
H37	1547.32	193.75	T510GB37RL0		C13	1567.13	191.30	T510GA13RL0
C37	1547.72	193.70	T510GA37RL0		Non-ITU	1529.16 – 1567.13		T510GRL0
H36	1548.11	193.65	T510GB36RL0					



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



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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.

ISO 9001:2008
EQA
QUALITY ASSURED COMPANY

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