Alcatel 1945 LMM

10 Gb/s EA-ILM laser module

With integrated wavelength monitoring

Description

The Alcatel 1945 LMM contains a state-of-the-art high performance DFB laser chip integrated with an electro-absorption modulator (EA-ILM) and is designed for 10Gb/s long haul DWDM digital transmission systems on (up to 90km distance on SMF). This module is designed for DWDM applications with a spacing between the channels down to 50 GHz without using external locker. The module integrates a wavelength monitoring function in order to allow wavelength stabilization over product lifetime. Despite of this new feature, the package and the pinout of the new product stays compatible with the previous series , Alcatel 1915 LMM, without the integrated wavelength monitoring function, in order to avoid a complete redesign of existing boards. The choice of an analog output for the control signal will leave the freedom for the user to lock the wavelength either with a digital or an analog circuit.
The module incorporates also a thermoelectric cooler, precision thermistor, and optical isolator for stable operation under all conditions.

Features

- Integrated Fabry-Perot Etalon wavelength monitoring (replaces external lockers)
- 50 GHz spacing ITU-T channels
- InGaAsP monolithically Integrated DFB Laser and Modulator chip (EA-ILM)
- Low drive voltage ($\leq 2V_{PP}$)
- Very low power penalty over 90 Km of standard fiber for 10Gb/s operation
- Internal optical isolator
- Internal TEC and power monitoring photodiode
- High frequency industry-standard 7-pin butterfly package with 50Ω RF input and either K or GPO RF connector.

Applications

- STM-64 and OC-192 Long Reach DWDM transmission system
- Terminals for submarine DWDM transmission systems

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Electro-Optic Characteristics

Parameter	Symb.	Conditions	Min	Max	Units
Laser					
Threshold current (BOL)	I_{TH}	CW, V_{Bias} = 0V	5	35	mA
Operating current (BOL)	I_{OP}	CW, V_{Bias} = 0V	60	80	mA
Laser forward voltage	V_F	CW, I_{OP}, V_{Bias} = 0V		2	V
Optical output power	P_{AVE}	I_{OP}, V_{mod}, (1)	-5		dBm
Laser chip temperature range for Wavelength tunability	Tλ	See (3)	15	30	°C
Side mode suppression ratio	SMSR		35		dB
Dispersion penalty	DS	See (1), (2)		2	dB
Dynamic extinction ratio	DER	See note 1	10		dB
Modulator bias voltage	V_{Bias}	See (1)	-2	0	V
Modulator drive voltage	V_{MOD}	See (1)		2	V
Cut-off frequency	S_{21}	@-3 dB, V_{Bias} = -1V, 50Ω	10		GHz
RF return loss	S_{11}	V_{Bias}= -1V, DC to 7GHz	10		dB
Rise time / Fall time	t_r/t_f	(1), (2), 10%,90%		45	ps
Thermistor resistance	R_{TH}	T_S = 25°C	9.5	10.5	kΩ
TEC current (EOL)	I_t	I_{OP}=100mA, ΔT=45°C, T_C=65°C, V_{Bias}= -1V		1.3	A
TEC voltage (EOL)	V_t	I_{OP}=100mA, ΔT=45°C, T_C=65°C, V_{Bias}= -1V		2.5	V
Tracking error	TR	Ts=25°C, Tc=65°C, I_{OP}=100mA, TR=10log[P(65°C)/P(25°C)]	-0.5	+0.5	dB

Notes: All limits start of life, Tcase=25°C, Tsubmount=15 to 30°C, Vr=-5V, unless otherwise stated.

(1) BER = 10^{-10}; 9.953 Gbit/s modulation; 2^{23} - 1 PRBS; NRZ line code; DER≥10 dB, P_{AVE}
(2) 1600 ps/nm dispersion assuming fiber with an average dispersion of 18 ps/nm/km
Optical power in the fiber shall not exceed the linear transmission regime.
(3) Tchip = Tλ .Tλ is chip temperature required to meet target wavelength

Wavelength monitoring section

Two photodiodes are used to ensure both optical power monitoring and wavelength monitoring. The first one (power monitoring) is referenced as monitoring photodiode (PD_{mon}) whereas the second one (wavelength monitoring) is referenced as filter photodiode (PD_{filt}).

	Symb.	Min	Max	Unit
Power Monitoring Photodiode current	I_{PDmon}	20		µA
Filter Monitoring Photodiode	I_{PDfilt}	20		µA
Photodiodes dark current	I_{dark}		0.1	µA
Center wavelength	λ_c		ITU grid	
Wavelength stability over lifetime	$\Delta\lambda_c$	-2.5	+2.5	GHZ
Wavelength capture range	CR	90		GHz
Filter slope (normalized to maximum PD_{filt} current)	FS	2	10	nm^{-1}
Electrical responsivity ratio between power monitoring channel and filter monitoring channel	ERT		± 6	dB

Absolute maximum ratings

Exposing the device to stresses above those listed in absolute maximum rating could cause permanent damage.
Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Environmental

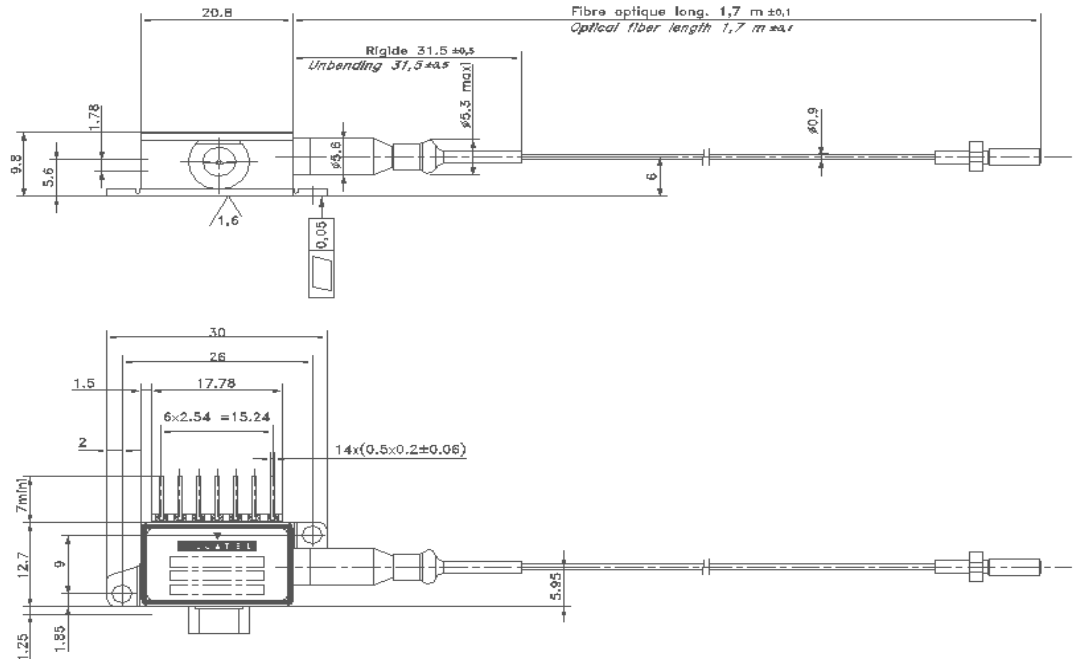
Parameter	Min	Max	Unit
Storage temperature	-40	70	°C
Operating temperature	0	65	°C
Lead soldering time (260°C)		10	s
Axial force on fiber (10 seconds max.)		5	N
Fiber bend radius	30		mm
TEC voltage		2.8	V
TEC current		1.4	A
ESD (1) applied on Laser		2000	V
ESD (1) on Modulator		500	V

(1) Human body model

Electro-optic

Parameter	Min	Max	Unit
Laser forward current		150	mA
Laser reverse voltage		2	V
Modulator forward voltage		1	V
Modulator reverse voltage		5	V
Photodiode reverse Voltage		20	V
Photodiode forward Current		1	mA

Mechanical details (in mm)



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Pin allocation

Pin	Description
1	λ Monitoring PD anode (-)
2	Thermistor
3	Laser DC Bias (+)
4	Power Monitoring PD Anode (-)
5	Common Power Monitoring and λ Monitoring PD Cathode (+)
6	TE Cooler (+)
7	TE Cooler (-)
8	EA modulator cathode
Case ground	Modulator anode/thermistor

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Standards

ITU-T G.652 optical fiber

IEC 68-2 and MIL STD 883 environment

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