ML7XX1A SERIES

FOR OPTICAL COMMUNICATION

TYPE NAME

ML7781A, ML7911A

DESCRIPTION

ML7XX1A series are InGaAsP high power laser diodes which provide a stable, single transverse mode oscillation with emission wavelength of 1310nm and standard continuous light output of 25mW.

ML7XX1A are hermetically sealed devices having the photodiode for optical output monitoring. This high-performance, high reliability, and long-life laser diode is suitable for such high-power applications as the light sources for OTDR systems and long-distance optical communication systems.

FEATURES

- Low threshold current, low operating current
- Built-in photodiode (ML7781A)
- High reliability, long operation life
- High power (CW 25mW, Pulse 100mW)
- 1310nm typical emission wavelength
- High speed of response
- Stable fundamental transverse mode oscillation

APPLICATION

Digital communication systems, OTDR systems

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
P_O	Light output power	CW	30	mW
I_F	Forward current	Pulse (Note 1)	400	mA
V_{RL}	Reverse voltage (Laser diode)	–	2	V
V_{RD}	Reverse voltage (Photodiode)	–	20	V
I_{FD}	Forward current (Photodiode)	–	2	mA
T_C	Case temperature	–	−20~+50	℃
T_{stg}	Stroage temperature	–	−40~+100	℃

Note 1 : Duty less than 1%, pulse width less than 1 μs.

ELECTRICAL/OPTICAL CHARACTERISTIC (T_C = 25℃)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{th}	Threshold current	CW	–	10	30	mA
I_{OP}	Operating current	CW, P_O = 25mW	–	70	130	mA
V_{OP}	Operating voltage	CW, P_O = 25mW	–	1.5	2.0	V
$P_{O(P)}$	Pulse ligth output	Pulse (Note 1), I_F = 350mA	100	–	–	mW
λ_P	Peak wavelength	CW, P_O = 25mW	1280	1310	1330	nm
$\Delta\lambda$	Spectral half width	CW, P_O = 25mW	–	8	–	nm
$\theta_{//}$	Beam divergence angle (parallel)	CW, P_O = 25mW	–	25	–	deg.
$\theta_\perp$	Beam divergence angle (perpendicular)	CW, P_O = 25mW	–	30	–	deg.
t_r, t_f	Rise and fall times	I_F = I_{th}, P_O = 25mW, 10%~90%	–	0.3	–	ns
I_m	Monitoring output current (Photodiode)	CW, P_O = 25mW, V_{RD} = 1V, R_L = 10Ω (Note 2)	0.2	0.5	–	mA
I_D	Dark current (Photodiode)	V_{RD} = 10V	–	0.2	0.5	μA
C_t	Capacitance (Photodiode)	V_{RD} = 10V, f = 1MHz	–	8	20	pF
$P_{m(Note\ 3)}$	Monitoring light output	CW, P_O = 25mW	–	1.0	–	mW

Note 2 : R_L is load resistance of the photodiode.
3 : P_m only apply to ML7911A.

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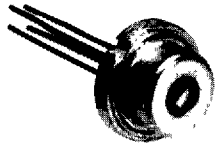
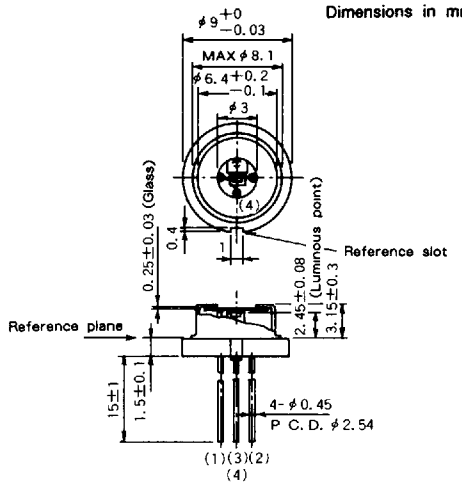
OUTLINE DRAWINGS

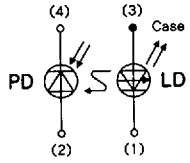
ML7781A



Dimensions in mm

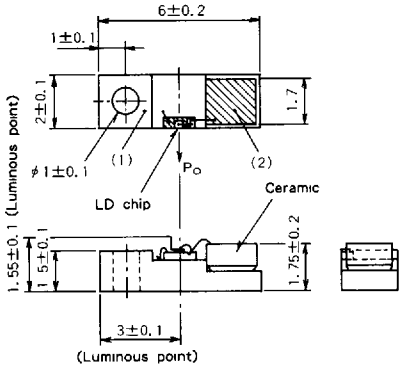


(φ 9mm, 4pin, Low cap package)



ML7911A

Dimensions in mm



(Chip carrier package)

SAMPLE CHARACTERISTICS

1 Light output vs. forward current

Typical light output vs. forward current characteristics are shown in Fig. 1. The threshold current for lasing is typically 10mA at room temperature. Above the threshold, the light output increases linearly with current, and no kinks are observed in the curves. An optical power of about 25mW is obtained at I_{th} + 60mA.

As can be seen in Fig. 1. I_{th} and slope efficiency η (dP_O/dI_F) depends on case temperature, obtaining a constant output at varying temperatures requires to control the case temperatureT_C or the laser current. (Control the case temperature or laser current such that the output current of the built-in monitor PD becomes constant.)

Fig. 1 Light output vs. forward current (CW)

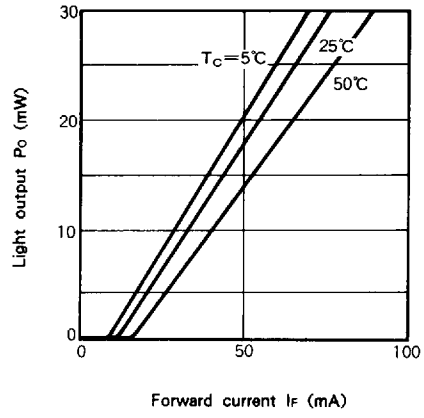
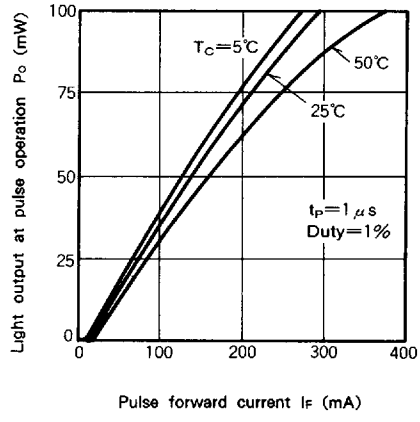


Fig. 2 shows a typical light output vs. forward current under pulse operation.

Pulse conditions are pulse width $t_P = 1\ \mu$sec and duty = 1%.They emit light power of 100mW up to 50℃ case temperature.

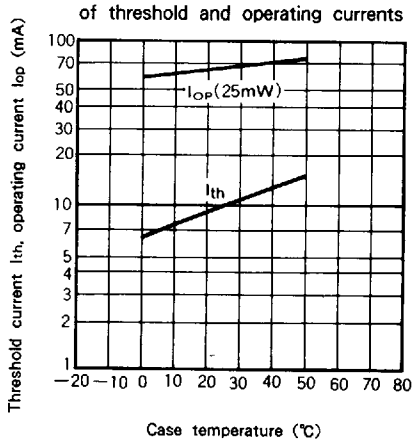
Fig. 2 Pulse light output vs. forward current at pulse operation



2 Temperature dependence of I_{th}, I_{OP}

Typical temperature dependence of the threshold and operating currents is shown in Fig. 3. The characteristic temperature T_O of the threshold current is typically 55K for $T_C \leqq 50$℃, where the definition of T_O is I_{th} (T_C/T_O).

Fig. 3 Temperature dependence of threshold and operating currents



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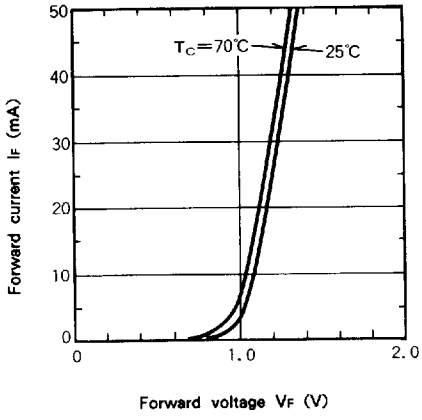
3 Forward current vs. voltage

Typical forward current vs. voltage characteristics are shown in Fig.4. In general, as the case temperature rises, the forward voltage V_F decreases slightly against the constant current I_F. V_F varies typically at a rate of $-1.3mV/℃$ and $-1mW/℃$ at $I_F = 1mA$ and 10mA, respectively.

Fig. 4 Forward current vs. voltage

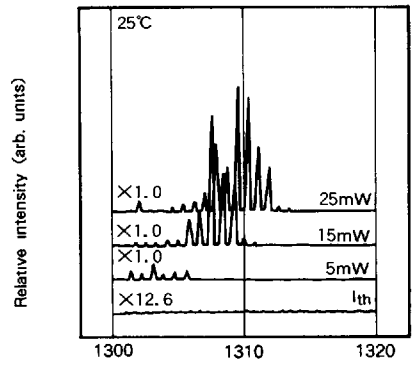


4 Emission spectra

Typical emission spectra under CW opertaion are shown in Fig.5. In general, at an output of 25mW, several modes are observed. Longitudinal mode spacings are typically 1nm and spectral width (FWHM) is typically 8nm at an output of 25mW.

The peak wavelength depends on the operating case temperature and the forward current (output level).

Fig. 5 Emission spectra under CW operation

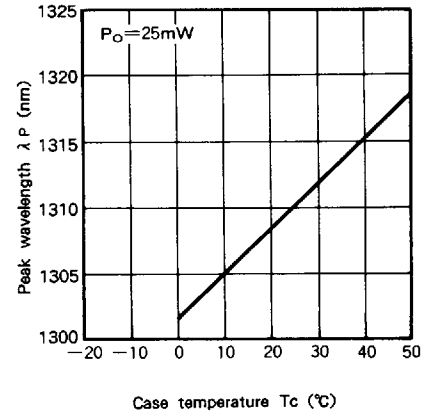


5 Temperature dependence of peak wavelength

A typical temperature dependence of the peak wavelength at an output of 25mW is shown in Fig. 6

As the temperature rises, the peak wavelength shifts to the long – wavelength side at a rate of about 0.35nm/℃.

Fig. 6 Temperature dependence of peak wavelength



6 Far-field pattern

The ML7XX1A laser diodes lase in fundamental transverse (TE_{00}) mode and the mode does not change with the current. They have a typical emitting area (size of near-field pattern) of 1.0 × 1.25 μm^2. Fig. 7 and 8 show the typical far-field patterns.

The full angles at half maximum points (FAHM) are typically 25deg. and 30deg., respectively.

Fig. 7 Far-field patterns in plane parallel to heterojunctions $\theta //$

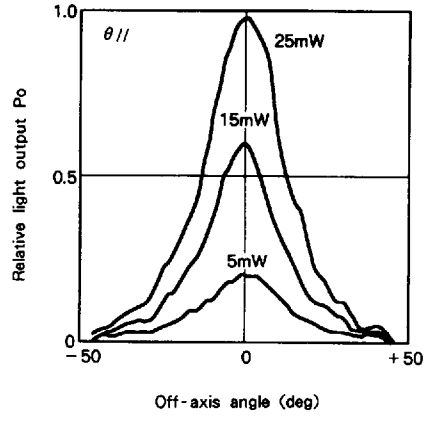
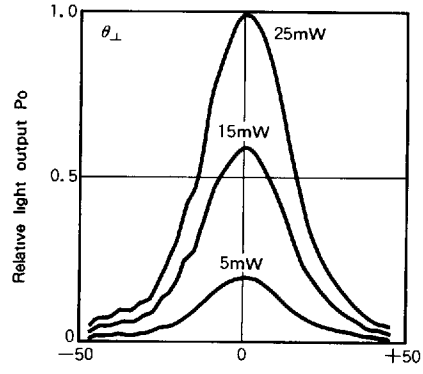


Fig. 8 Far-field patterns in plane perpendicular to heterojunctions $\theta \perp$



7 Monitoring output

The laser diodes emit beams from both of their mirror surfaces, front and rear surfaces. The rear beam can be used for monitoring the power of the front beam since the power of the rear beam is proportional to the front one. In the ML7XX1A series, the rear beam power is changed into photocurrents by monitor photodiodes. Fig. 9 shows typical light output vs. monitoring photocurrent characteristics. Above the threshold current, the monitoring photocurrent increases linearly with the front light output. The monitoring output current is typically 0.5mA when the front light output is 25mW. In the ML7911A, monitor photodiodes is not installed in the laser package. Monitoring output is emitted from the back of package. Monitoring output is typically 1mW when the front light output is 25mW.

Fig. 9 Light output vs. monitoring output current