HL7831G/HG

GaAlAs LD

T-41-05

Description

The HL7831G/HG are 0.78 µm band GaAlAs laser diodes with a double heterojunction structure. MOCVD technology is employed for precise device analysis and optimization to realize low noise.

Features

- Visible light output: λp = 770 to 795 nm
- Built-in monitor photodiode
- Multi longitudinal mode
- Low noise: S/N = 60dB min.
- Astigmatism: $|A_s| \leq 10$ µm (HL7831HG)

Absolute Maximum Ratings (T_C = 25°C)

Item	Symbol	Rated Value	Units
Optical output power	P_O	5	mW
Pulse optical output power	$P_{O\,(pulse)}$	6*	mW
LD reverse voltage	$V_{R\,(LD)}$	2	V
PD reverse voltage	$V_{R\,(PD)}$	30	V
Operating temperature	T_{opr}	–10 to +60	°C
Storage temperature	T_{stg}	–45 to +85	°C

* At a duty cycle under 50% and pulse widths under 1 µs

Optical and Electrical Characteristics (T_C = 25°C)

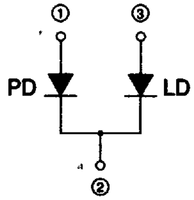
Item		Symbol	Min	Typ	Max	Units	Test Conditions
Threshold current		I_{th}	—	50	80	mA	
Optical output power		P_O	5	—	—	mW	Kink free
Slope efficiency		η	0.1	0.25	0.6	mW/mA	$\frac{3\ (mW)}{I\ (4\ mW) - I\ (1\ mW)}$
Lasing wavelength		λ_p	770	785	795	nm	P_O = 3 mW
Beam divergence (parallell)		$\theta_{//}$	9	13	16	deg.	P_O = 3 mW
Beam divergence (perpendicular)		$\theta_{\perp}$	20	35	48	deg.	P_O = 3 mW
Monitor current	HL7831G	I_S	0.3	1.0	1.6	mA	$V_{R\,(PD)}$ = 5 V
	HL7831HG		0.15	—	0.6		P_O = 3 ± 0.05 mW
Noise		S/N	60	—	—	dB	P_O = 3 mW, f = 750 kHz, Δf = 30 kHz

HL7831G/HG

Internal Circuit

T-41-05

Package Type
- HL7831G: G2
- HL7831HG: HG



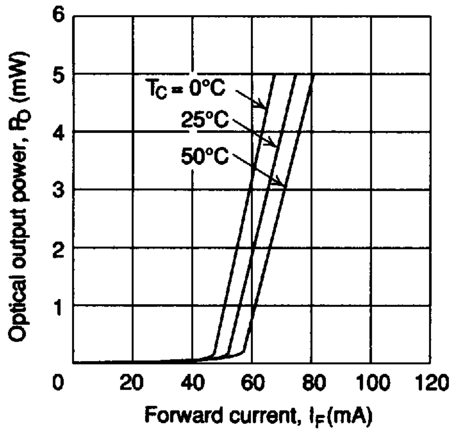


Figure 1 Optical Output Power vs. Forward Current

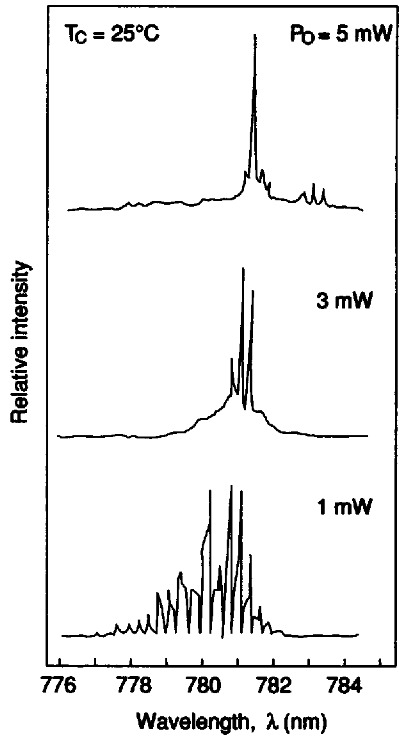


Figure 2 Lasing Spectrum

T-41-05

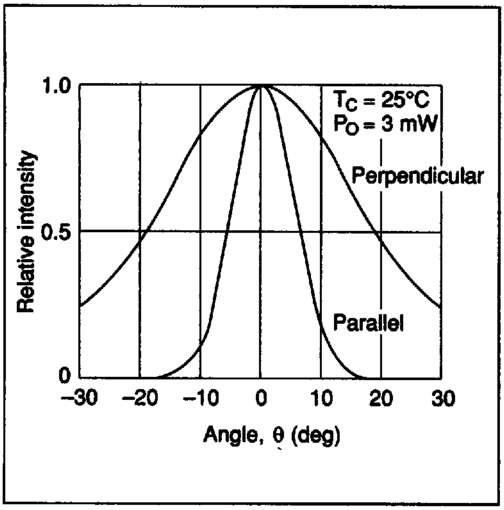


Figure 3 Far Field Pattern (HL7831G)

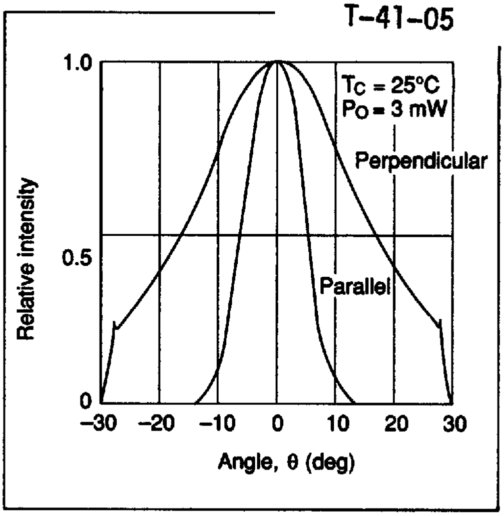


Figure 4 Far Field Pattern (HL7831HG)

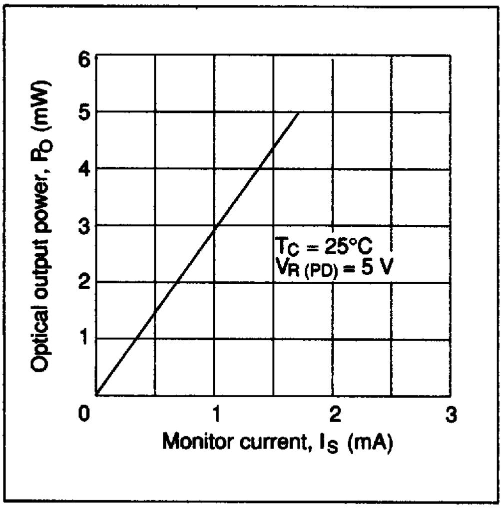


Figure 5 Optical Output Power vs. Monitor Current (HL7831G)

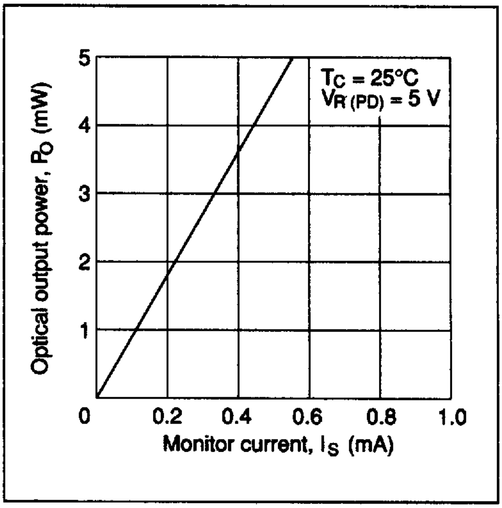


Figure 6 Optical Output Power vs. Monitor Current (HL7831HG)

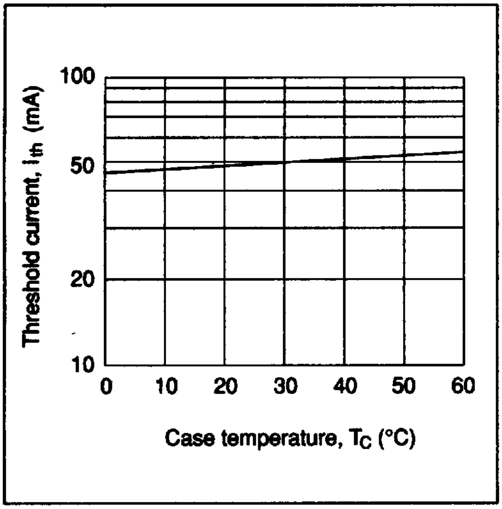


Figure 7 Threshold Current vs. Case Temperature

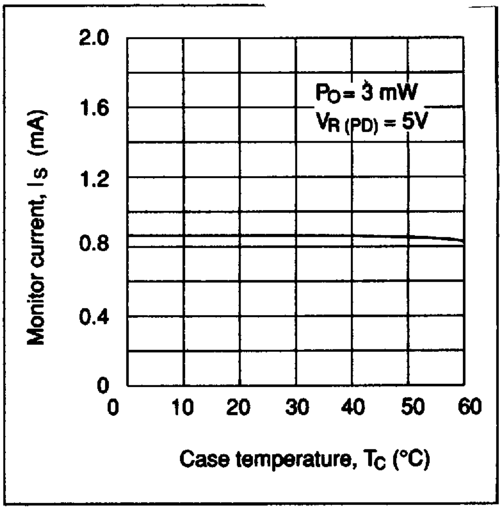


Figure 8 Monitor Current vs. Case Temperature (HL7831G)

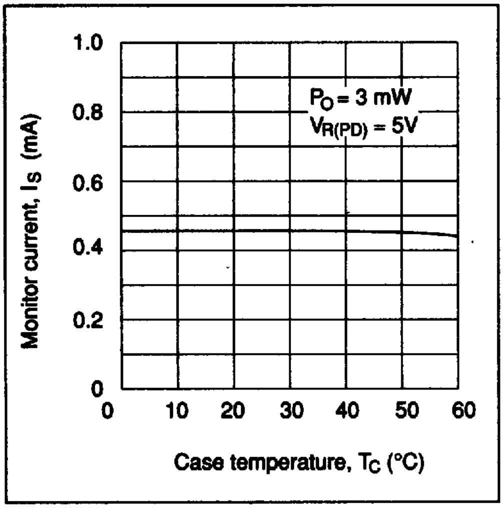


Figure 9 Monitor Current vs. Case Temperature (HL7831HG)

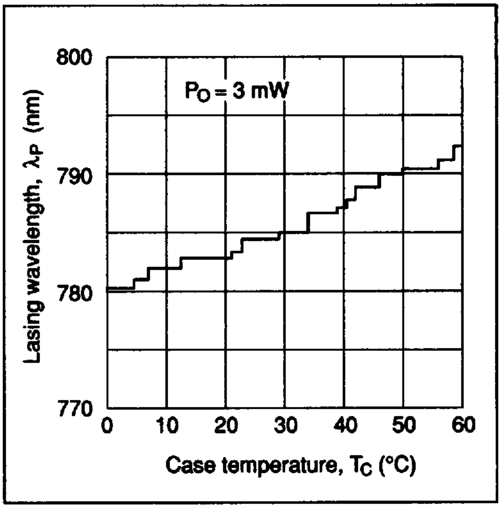


Figure 10 Lasing Wavelength vs. Case Temperature

T-41-05

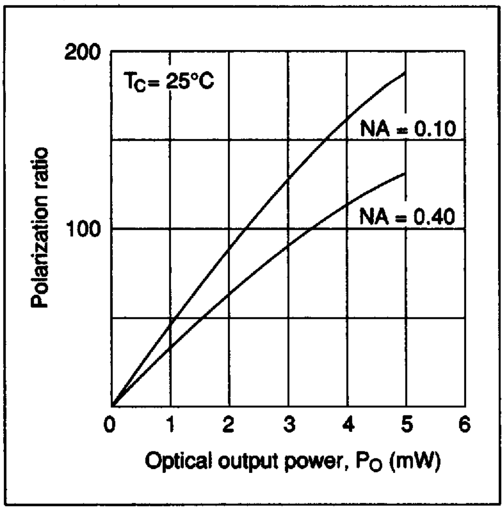


Figure 11 Polarization Ratio vs. Optical Output Power (HL7831G)

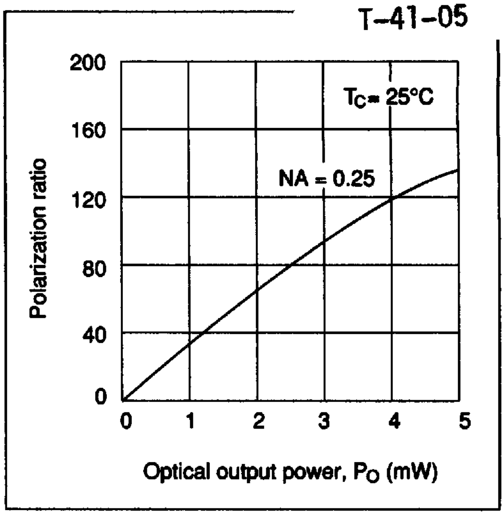


Figure 12 Polarization Ratio vs. Optical Output Power (HL7831HG)

T-90-40

Section 6 Reliability

This section covers points which particularly affect the operating life light emitting devices, and provides some examples which should be studied before proceeding with your system design.

6.1 Characteristic Drift

When optical emission devices such as the LD or IRED are operated in the forward mode, crystal defects (point defects and dislocations) propagate in the active region of the crystal.

These crystal defects cause optical emission characteristics (optical output power, threshold current, etc.) to drift, and ultimately lead to the end of the device's useful operating life. Figure 6-1 shows an example of drift in the optical output power vs current characteristic of a LD. From t_1 to t_4, the threshold current increases and the slope efficiency declines. The end of useful operating life is defined as the point where the operating current becomes 1.5 times of its initial value.

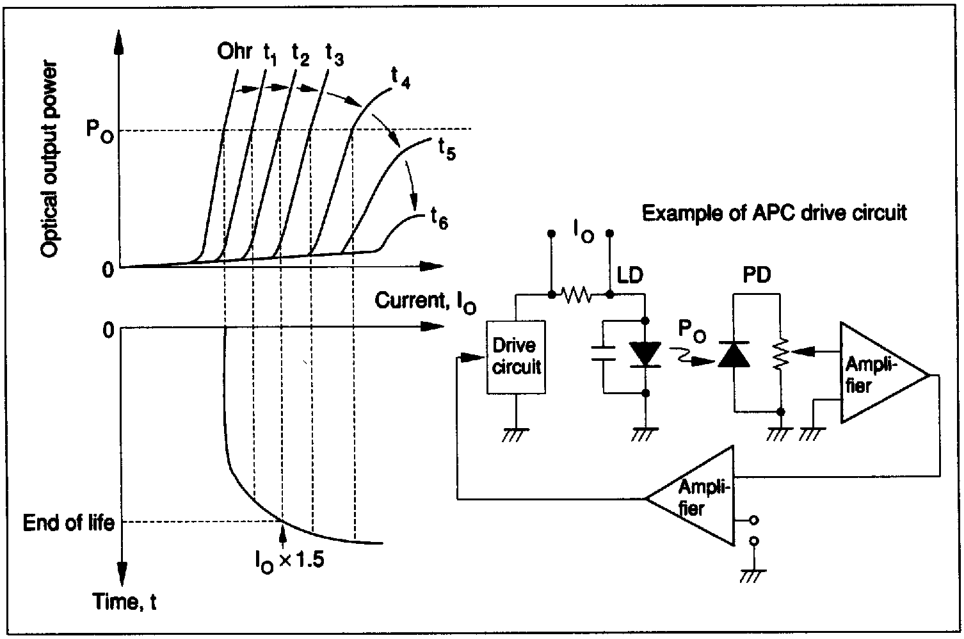


Figure 6-1 Example of Drift in LD Optical Output Power vs. Current Characteristic

6.2 Derating

T-90-40

LDs and IREDs have a strong temperature dependence of lifetime. Thus, the expected operating life shows an exponential decrease with operating temperature. Derating should be employed to keep the rise of junction temperature as small as possible. (See figure 6-2, and 6-3). Figure 6-4 shows the dependence of operating life on optical output power. Please note that this decrease in operating life occurs even at threshold current bias.

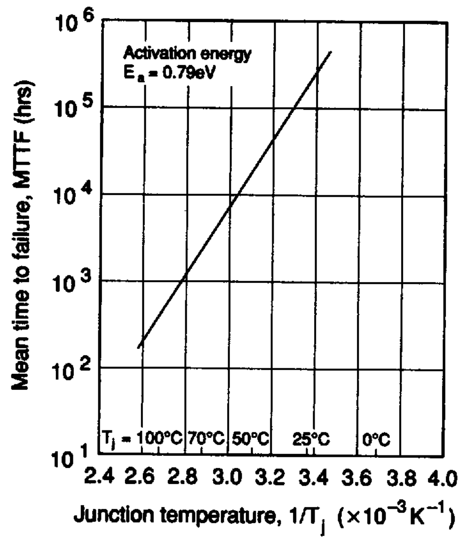


Figure 6-2 LD Mean Time to Failure vs. Junction Temperature (Example)

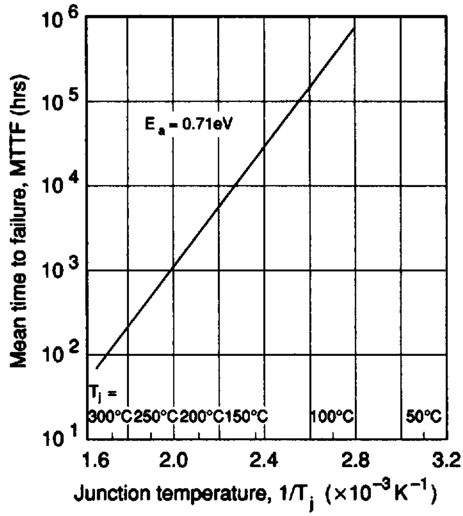


Figure 6-3 IRED Mean Time to Failure vs. Junction Temperature (Example)

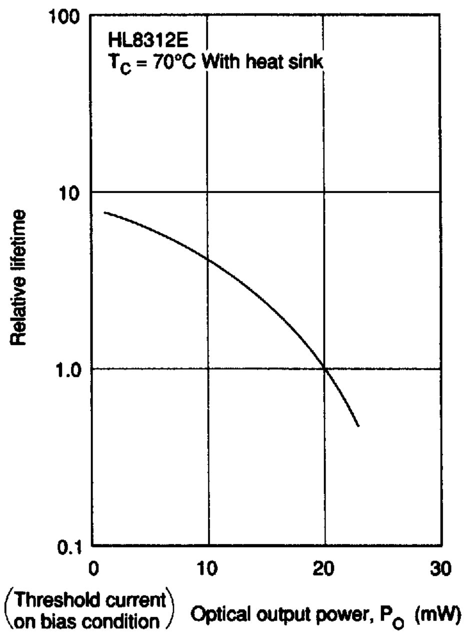


Figure 6-4 LD Operating Life vs. Optical Output Power (Example)

Figure 6-5 shows operating current dependence of IRED lifetime. In particular, when operated in open air at high current, the operating life is drastically affected by the rise in junction temperature due to heat generated by the device. Careful attention must be paid to carrying away excess heat.

T-90-40

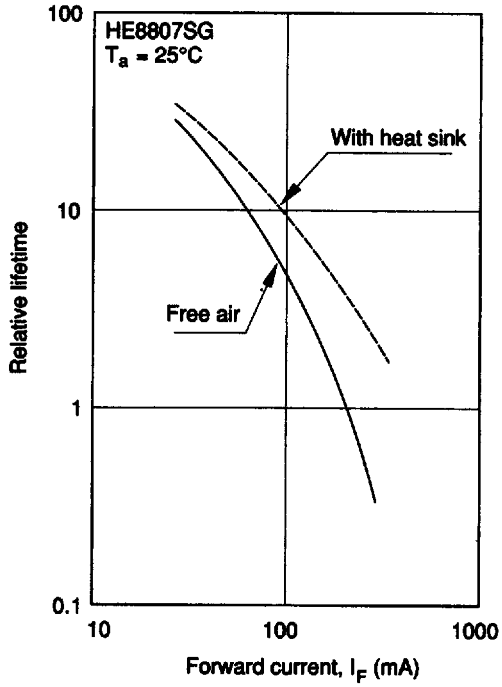


Figure 6-5 IRED Operating Life vs. Forward Current (Example)

6.3 Estimation for Useful Operating Life

The operating life of light emitting devices exhibits the typical wear failure distribution, and thus is generally approximated by the lognormal distribution. Figure 6-6 shows an example distribution for LD operating life. When the temperature derating and optical output power derating discussed in the previous section are also considered, the actual expected operating life under given operating conditions can be estimated.

T-90-40

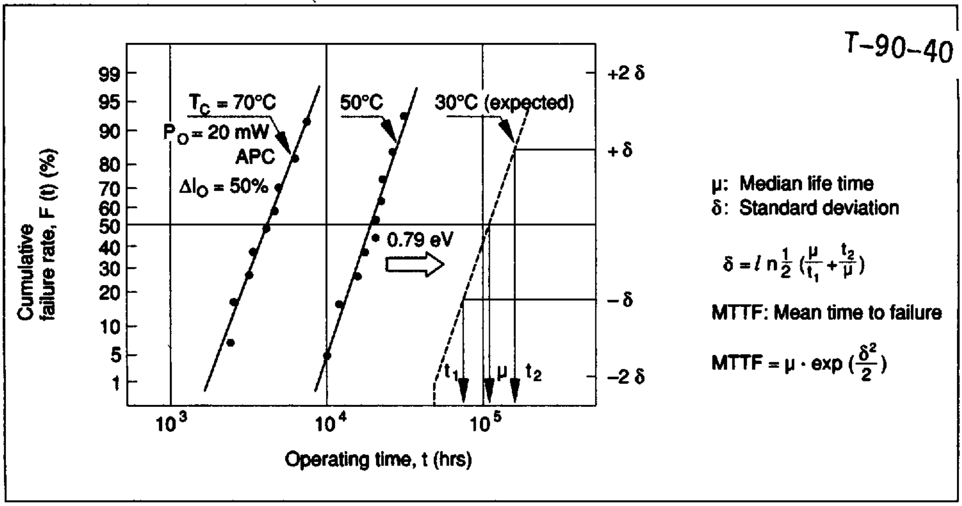


Figure 6-6 Distribution of Expected LD Life (Example)

6.4 Standard Devices Graded by Expected Life

Hitachi classifies IREDs of standard-specifications by life levels and applications as shown in table 6-1. For special requests or further details, please see your Hitachi representative.

Table 6-1 Lifetime and Application for Standard-specification IREDs

Applications	Expected Life Time	Operating Conditions	Criteria	Applicable Products
Auto-focusing still camera	10 hrs.	I_F = 200 mA	F(t) = 0.1%, $\Delta P_O \leq 30\%$	HE8815VG HE8813VG
Auto-focusing VTR camera	200 hrs.	I_F = 250 mA f = 10 kHz, duty 25%	F(t) = 0.1%, $\Delta P_O \leq 30\%$	HE8815VG
Measurement or general use	1000 hrs.	$T_j \leq P_O$ 100°C	F(t) = 0.1%, $\Delta P_O \leq 30\%$	HLP series, HE8811, HE8812SG, HE8404SG, HE7601SG
Industrial use	10000 hrs.	$T_j \leq$ 100°C	F(t) = 1%, $\Delta P_O \leq 50\%$	HE8807 series
Communications use	24000 hrs.	$T_j \leq$ 100°C	F(t) = 1%, $\Delta P_O \leq 50\%$	HE8403 series, HE1301 series