T-41-05

Description

The HL8318E/G are high-power 0.8 µm band GaAlAs laser diodes with a double heterojunction structure. Their internal circuit configuration is suited for operation on a single positive supply voltage. They are suitable as light sources for optical disk memories and various other types of optical equipment.

Features

- Infrared light output: λp = 810 to 850 nm
- High power: standard continuous operation at 40 mW (CW), pulsed operation at 50 mW
- Built-in monitor photodiode
- Single longitudinal mode
- Low astigmatism: A_S = 3 µm Typ.

Absolute Maximum Ratings (T_C = 25°C)

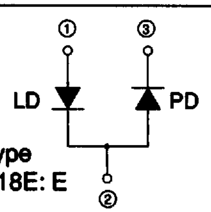
Item	Symbol	Rated Value	Units
Optical output power	$P_{O\,(CW)}$	40	mW
Pulse optical output power	$P_{O\,(pulse)}$	50*	mW
LD reverse voltage	$V_{R\,(LD)}$	2	V
PD reverse voltage	$V_{R\,(PD)}$	30	V
Operating temperature	T_{opr}	–10 to +60	°C
Storage temperature	T_{stg}	–40 to +85	°C

* Maximum 50% duty cycle, maximum 1 µs pulse width

Optical and Electrical Characteristics (T_C = 25°C)

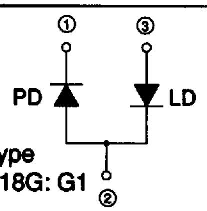
Item	Symbol	Min	Typ	Max	Units	Test Conditions
Threshold current	I_{th}	—	40	70	mA	
Optical output power	P_O	40	—	—	mW	Kink free
Slope efficiency	η	0.4	0.5	0.9	mW/mA	$\frac{24\ (mW)}{I_{(32\ mW)} - I_{(8\ mW)}}$
Lasing wavelength	λ_P	810	830	850	nm	P_O = 40 mW
Beam divergence (parallel)	$\theta_{//}$	8	11	14	deg.	P_O = 40 mW, FWHM
Beam divergence (perpendicular)	$\theta_{\perp}$	18	25	32	deg.	P_O = 40 mW, FWHM
Monitor current	I_S	40	100	240	µA	$V_{R\,(PD)}$ = 5 V, P_O = 4 mW

Internal Circuit



Package Type
• HL8318E: E

HL8318E



Package Type
• HL8318G: G1

HL8318G

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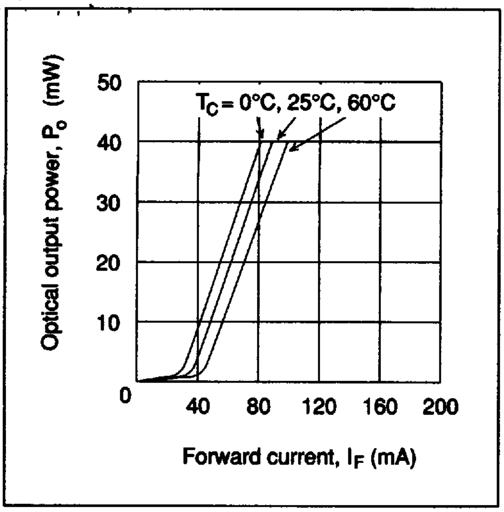

Figure 1 Optical Output Power vs. Forward Current

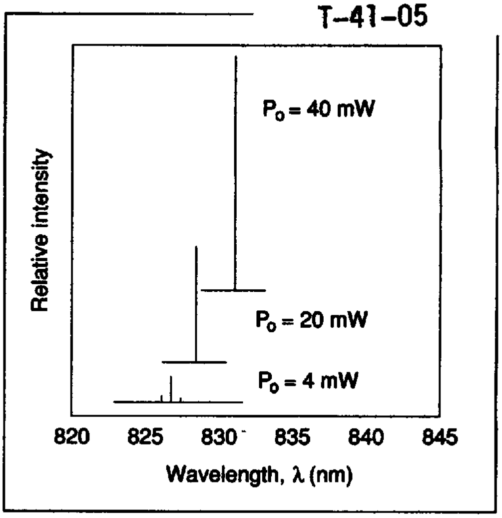

Figure 2 Lasing Spectrum

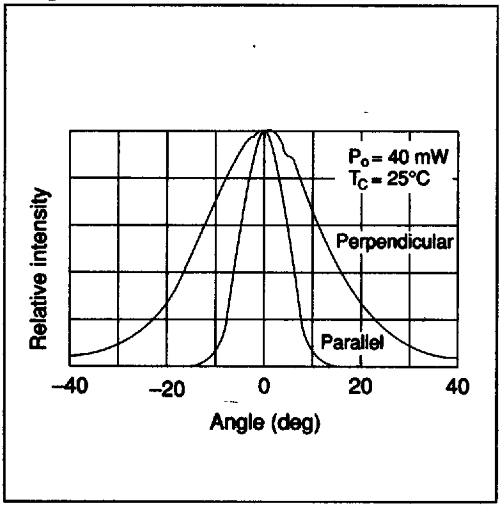

Figure 3 Far Field Pattern

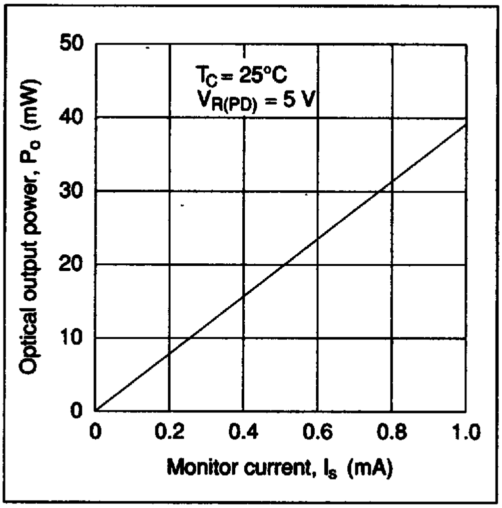

Figure 4 Monitor Current vs. Optical Output Power

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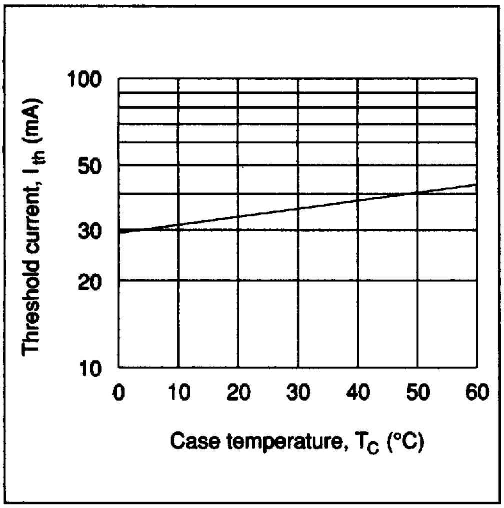

Figure 5 Temperature Dependence of Threshold Current

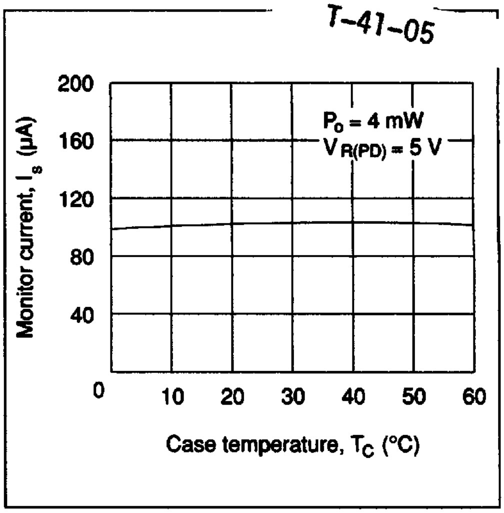

Figure 6 Temperature Dependence of Monitor Current

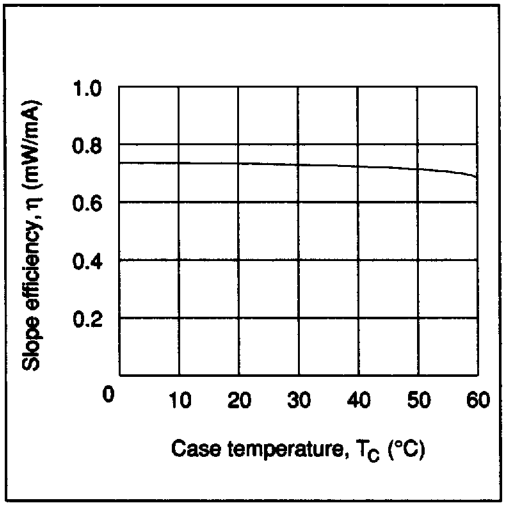

Figure 7 Temperature Dependence of Slope Efficiency

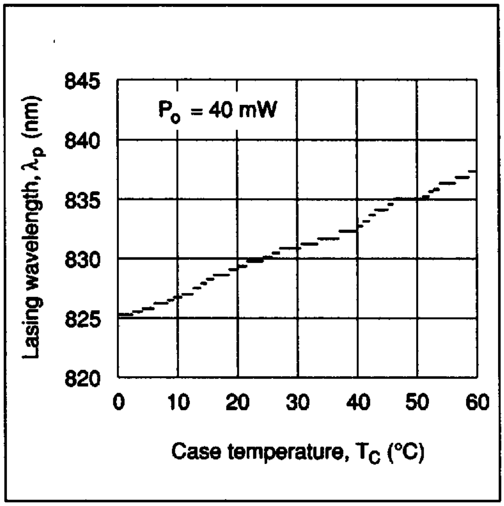

Figure 8 Temperature Dependence of Lasing Wavelength

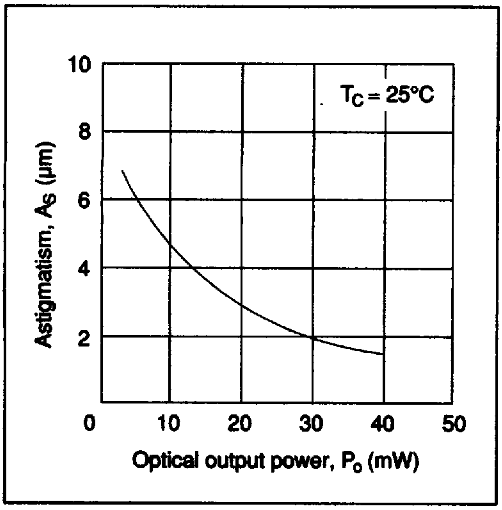

Figure 9 Optical Output Power Dependence of Astigmatism

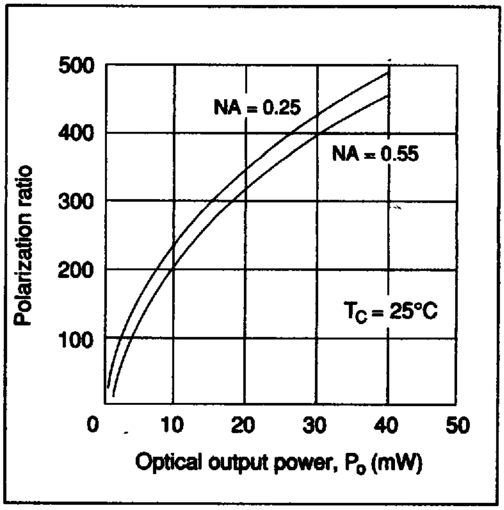

Figure 10 Optical Output Power Dependence of Polarization Ratio

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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.

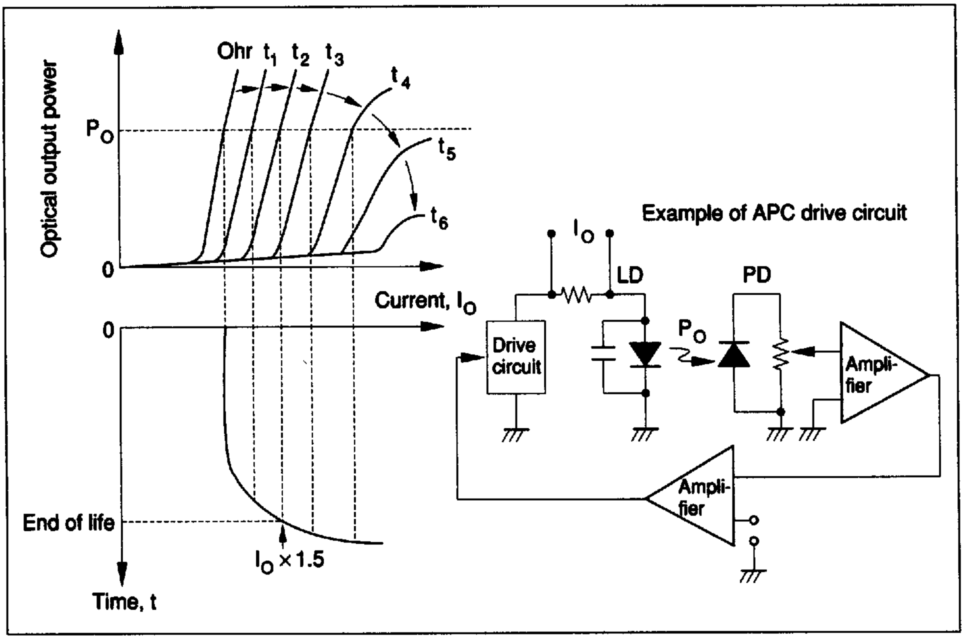

Figure 6-1 Example of Drift in LD Optical Output Power vs. Current Characteristic

6.2 Derating

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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.

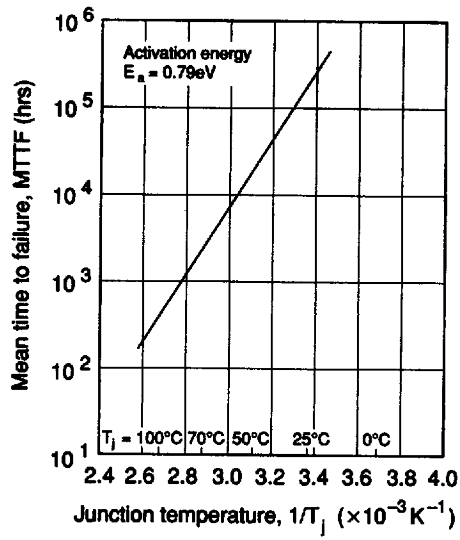

Figure 6-2 LD Mean Time to Failure vs. Junction Temperature (Example)

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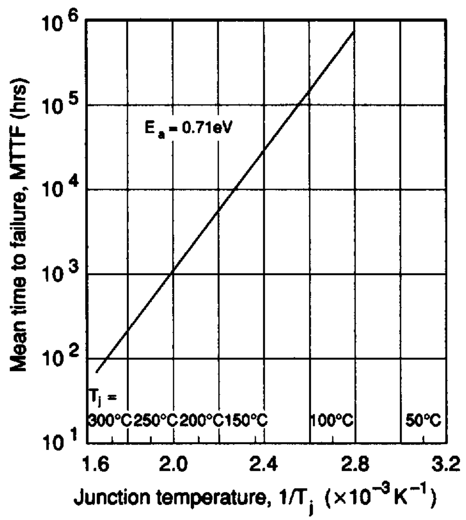

Figure 6-3 IRED Mean Time to Failure vs. Junction Temperature (Example)

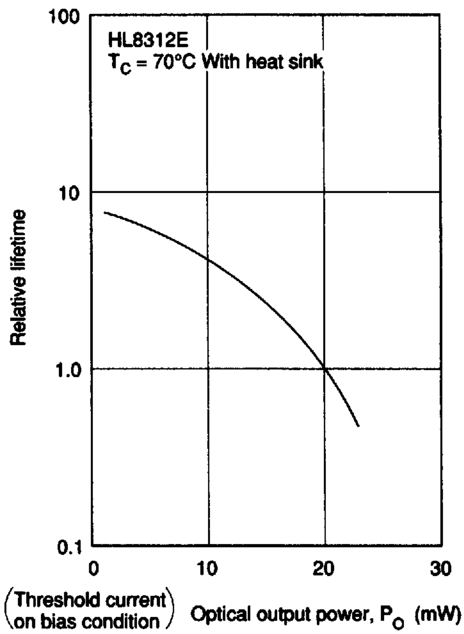

Figure 6-4 LD Operating Life vs. Optical Output Power (Example)

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.

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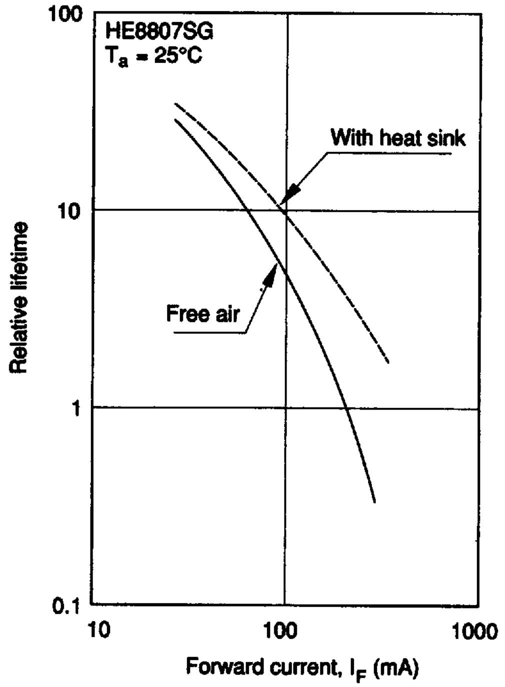

Figure 6-5 IRED Operating Life vs. Forward Current (Example)

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.

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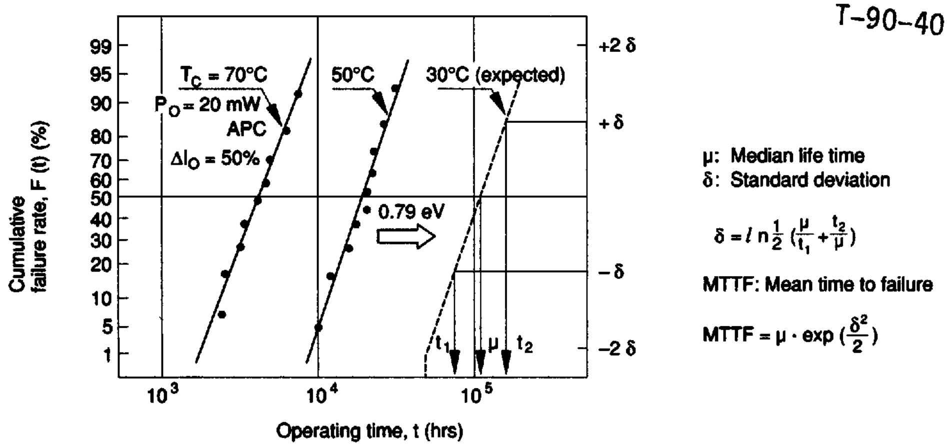

Figure 6-6 Distribution of Expected LD Life (Example)

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