QPGEW1S1.5H – Multi-Epi Pulsed Laser Diode in Plastic Package

High Power Edge Emitting Laser Diode at 905 nm

Excelitas' PGEW lasers produce very high peak optical pulses utilizing up to four active lasing layers at a centered wavelength at 905 nm. The lasers are available in TO-like T1¾ through-hole plastic packages.

Key Features

- High Power Output with small active area
- High Reliability
- 37.5 µm active laser length
- 4 active lasing layers
- High volume plastic TO package
- RoHS compliant

Applications

- LiDAR / ToF measurements
- Laser range finding
- Laser scanning / UGV
- Infrared night illumination
- Laser therapy
- Material excitation in medical and other analytical applications

All specifications are valid for T_A = 23 °C, t_p = 100 ns, f_p = 1 kHz and i_F = 5 A, unless otherwise specified.

Table 1: Key parameters

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Peak Optical Power	P	8	10		W
Wavelength	λ_C	895	905	925	nm
Operating Temperature[1]	T_{op}	-40		85	°C

Note 1: Extended temperature range specification available. Please contact Excelitas Technologies for more information

Table 2: Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Peak Reverse Voltage	V_{RM}	2	V
Peak Forward Current	i_F	5	A
Pulse Duration	t_W	100	ns
Duty Factor	du	0.1	%
Storage Temperature	T_S	-40 … 105	°C
Soldering for 5 Seconds (leads only)		260	°C

Note 1: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

Note 2: Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 3: Chip and Nearfield Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Units
Number of stripes	S		4		-
Emitting width[1,2]	w		50		µm
Emitting height[1,2]	h		15		µm

Note 1: The emitting area is defined as FWHM(w) x FWHM(h) of the nearfield size.

Note 2: Parameter changes slightly with drive current. Please contact Excelitas Technologies for more information.

Table 4: Emission Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Units
Spectral Width (FWHM)	$\Delta\lambda$		10		nm
Wavelength junction Temperature Coefficient	$\Delta\lambda/\Delta T_j$		0.25		nm/°C
Package Thermal Resistance[1]	R_{th}		91		°C/W
Divergence Parallel to Junction Plane	$\theta_{\parallel}$		10		degrees
Divergence Perpendicular to Junction Plane	$\theta_{\perp}$		25		degrees

Note 1: Simulated from the Chip Junction to the cathode PCB connection lead.

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Table 5: Electrical Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Units
Forward Voltage[1]	V_F		12.7		V
Threshold Current	i_{Th}		0.52		A
Series Resistance	R_S		0.64		Ω
Bandgap Voltage Drop	V_g		9.5		V
Package Inductance	L_P		1.6		nH

Note 1: As estimated by $V_F = R_S i_F + V_g$.

Figure 1: Laser Package Dimension QPGEW1S1.5H

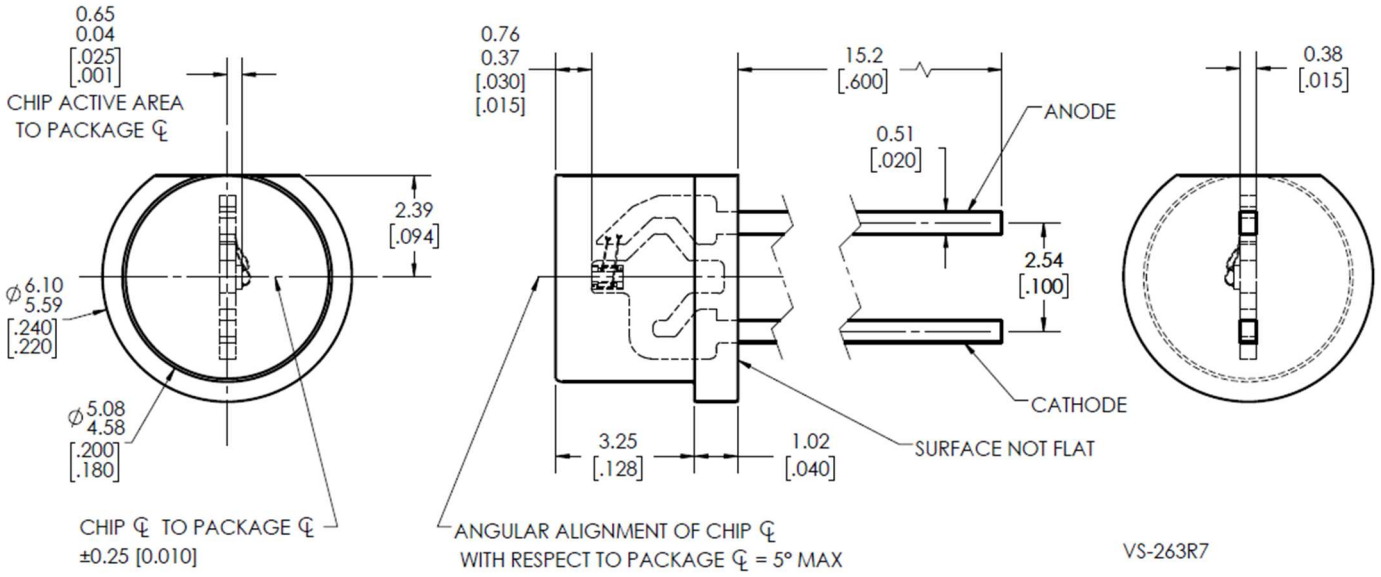

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Figure 2: Typical P vs. i_F

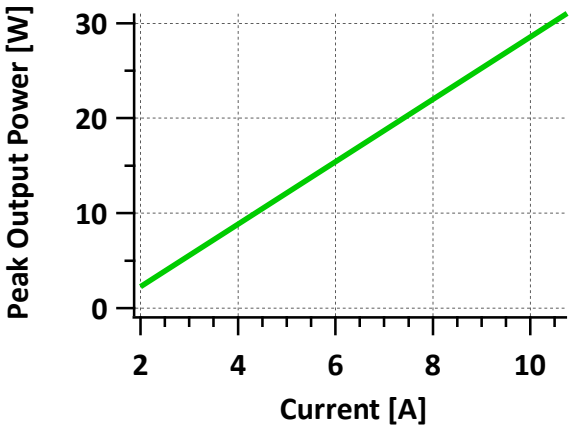


Figure 3: Typical Emission Spectrum

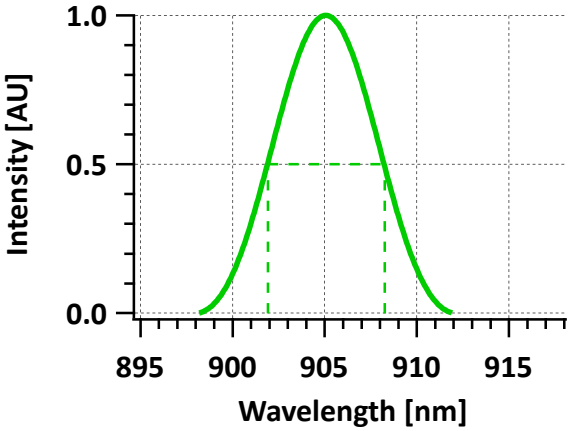


Figure 4: Typical λ vs. T_j

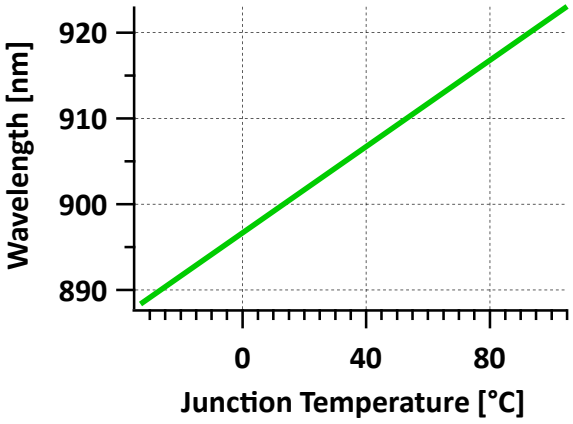


Figure 5: Typical P vs. T_j

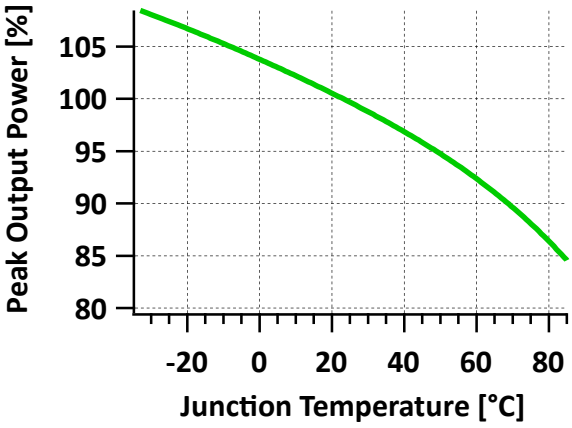


Figure 4: Typical $\theta_{\perp}$

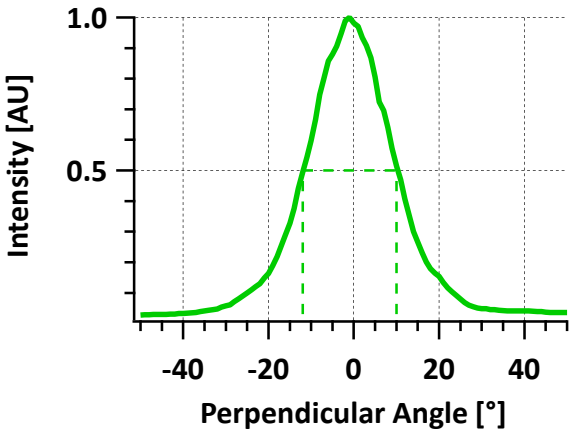
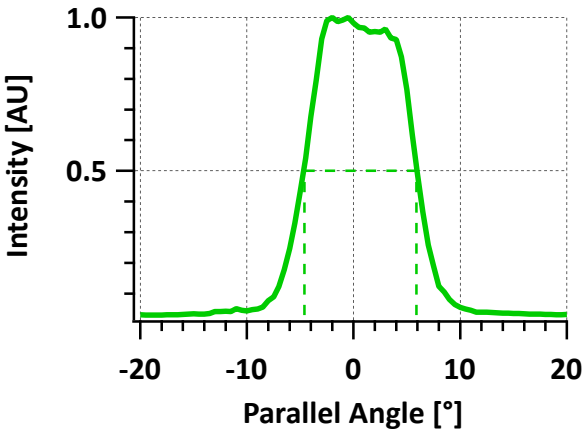


Figure 5: Typical $\theta_{||}$



QPGEW1S1.5H – Multi-Epi Pulsed Laser Diode in Plastic Package

High Power Edge Emitting Laser Diode at 905 nm

Information:

Excelitas Technologies' QPGEW1S1.5H semiconductor pulsed laser diode, emitting at 905 nm in the near IR, uses a monolithic chip design with four active lasing cavities. The cavities are epitaxially grown on a single GaAs substrate chip. The multi-layer chip design features emission of multiple laser lines within the diode, offering high output power in a small emitting area. The laser chips are fabricated by using metal organic chemical vapor deposition (MOCVD).

The T1¾ (TO-like) plastic encapsulated package complements Excelitas' PGA series epi-cavity lasers in hermetic metal or SMD packages and are ideally suited for high volume applications.

The beam propagation possesses a 25° divergence in the direction perpendicular to the chip surface and 10° divergence parallel to the chip surface. The output power shows an excellent stability over the full MIL specification temperature range.

Our quantum well laser design offers rise and fall times of < 1 ns. However, the drive circuit layout, packaging and mounting inductance play a dominant role and should be designed in accordance with the desired optical pulse width.

Where fiber coupling applications are concerned, the transverse spacing of the epi-cavity active area concentrates more optical power into a smaller geometry allowing for increased optical power coupling into optical fibers.

Please contact our experts at Excelitas Technologies when pulse widths in the range of 1 ns or fiber coupling applications are planned.

The peak wavelength at 905 nm is centered near the maximum responsivity of most silicon photodiodes. The QPGEW1S1.5H laser matches especially well with devices from the Excelitas EPI-APD C30737 family.

The devices are ideally suited for applications where cost is a primary concern and high-volume production capacity is required.

Unconnected laser dies as shipped cannot emit light. Light emission requires an installation into an electrical driver circuit.

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Principle of operation

The light output of a laser diode is proportional to the current running through the laser by pulsing it in the forward bias direction. A simple way of allowing a large current to flow within nanoseconds through the laser is to discharge a large capacitor into the laser by closing a GaN-FET.

Excelitas recommends the usage of a low-side driver to operate the laser. A detailed description of the circuitry to recharge the capacitors is omitted here since many options are available on the market. The voltage on the capacitors and discharge time will dictate the current flow in the laser.

Electrical circuits should be designed to protect the diodes from high current and reverse voltage transients.

Optimum long-term reliability will be attained with the semiconductor at or below room temperature. Adequate heat sinking should be employed, particularly when operated at maximum duty cycle.

Package inductance

When narrow pulse widths are required, the system designer must take care that circuit inductance is kept to a minimum. Using a low inductance package will reduce the peak voltage required to obtain the desired drive current.

For example, to obtain approximate Gaussian pulse shapes of 40 ns and 1 ns, the below voltage should be considered in addition to the typical forward voltage:

- 40 ns:
  - $t_p = 40\ \text{ns},\ t_r = 20\ \text{ns}$
  - $I_F = 5\ \text{A}, L_P = 1.6\ \text{nH}$
  - $V_P = \frac{1.6\ \text{nH x}\ 5\ \text{A}}{20\text{ns}} = 0.4\ \text{V}$

- 1 ns:
  - $t_p = 1\ \text{ns}, t_r = 0.5\ \text{ns}$
  - $I_F = 5\ \text{A}, L_P = 1.6\ \text{nH}$
  - $V_P = \frac{1.6\ \text{nH x}\ 5\ \text{A}}{0.5\text{ns}} = 16\ \text{V}$

Testing methods

Excelitas verifies the electro optical specifications on every shipped unit.
Visual inspection during fabrication is performed as per our quality standard and failed lasers are removed.

Packaging and shipping

For production and sampling quantities, lasers are placed inside plastic trays.

Storage and handling

This laser is a static-sensitive device. Therefore, Excelitas highly recommends following the below notes:

- Keep unused devices in ESD-safe material
- Protect devices from static discharge and static fields
- Precautions should be taken to avoid reverse polarity of power supply. Reversed polarity of power supply above the breakdown voltage listed under "Absolute Maximum Ratings" results in a destroyed unit.

For Your Safety: Laser Radiation

Under operation, these devices produce invisible electromagnetic radiation that may be harmful to the human eye. To ensure that these laser components meet the requirements of Class IIIb laser products, they must not be operated outside their maximum ratings. Power supplies used with these components must be such that the maximum peak forward current cannot be exceeded. It is the responsibility of the user incorporating a laser into a system to certify the Class of use and ensure that it meets the requirements of the ANSI or appropriate authority.

Further details may be obtained in the following publications:

21CFR 1040.10 – "Performance Standards for Light Emitting Products (Laser Products)"

ANSI Z136.1 – "American National Standard for Safe use of Lasers"

IEC 60825-1 – "Safety of Laser Products"

RoHS Compliance

This series of laser diodes are designed and built to be fully compliant with the European Union Directive on restrictions of the use of certain hazardous substances in electrical and electronic equipment.

Warranty

A standard 12-month warranty following shipment applies.

About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

Excelitas has a long and rich history of serving our OEM customer base with optoelectronic sensors and modules for more than 45 years beginning with PerkinElmer, EG&G, and RCA. The constant throughout has been our innovation and commitment to delivering the highest quality solutions to our customers worldwide.

From aerospace and defense to analytical instrumentation, clinical diagnostics, medical, industrial, and safety and security applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 7,000 employees in North America,

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