TO-56 & GUTS Package

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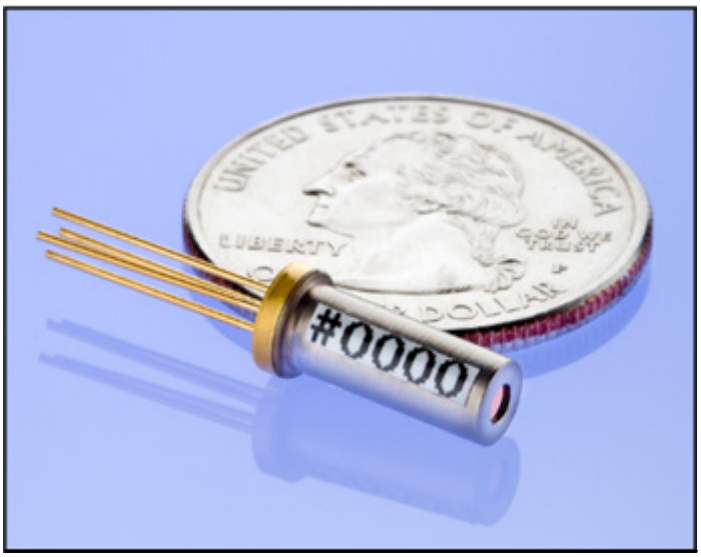

Our proprietary single-mode wavelength stabilized laser diode features high output power with ultra-narrow spectral bandwidth and a diffraction limited output beam. Designed to replace expensive DFB, DBR, fiber, and external cavity lasers, the Single-Mode Spectrum Stabilized Laser offers superior wavelength stability over time, temperature, and vibration; and is manufactured to meet the most demanding wavelength requirements.

Standard Wavelengths

633 nm	685nm	785nm	852nm
638nm	780nm	808nm	976nm
660nm	783nm	830nm	1053nm
			1064nm

Custom wavelengths available upon request

All specified wavelengths are measured "in-vacuum"

Applications

This laser package is designed for OEM Integration and is ideal for:

- High-Resolution Raman Spectroscopy
  - Handheld Raman Spectroscopy
  - Confocal Microscopy
  - Raman Imaging
  - Portable Raman
  - Process Raman
- Metrology/Interferometry
- Remote Sensing
- Laser speckle contrast imaging
- Laser illumination

Key Features

The TO-56 packaged product line comes standard with a circularized and collimated output beam, internal thermistor and ESD protection. Lasing wavelength can be accurately specified and repeatedly manufactured to within +/-0.1 nm upon request.

- High-Power Single-Spatial-Mode, Single-Frequency Output
- Ultra-Narrow Spectral Linewidth (~100 kHz)
- Stabilized Output Spectrum (< 0.007 nm/°C)
- Gaussian TEM00 Spatial Mode
- Circularized and Collimated Output Beam
- Integral ESD Protection & Thermistor
- Integral Laser Line Filter
- SMSR 70 dB w/ laser line filter (40 dB without)

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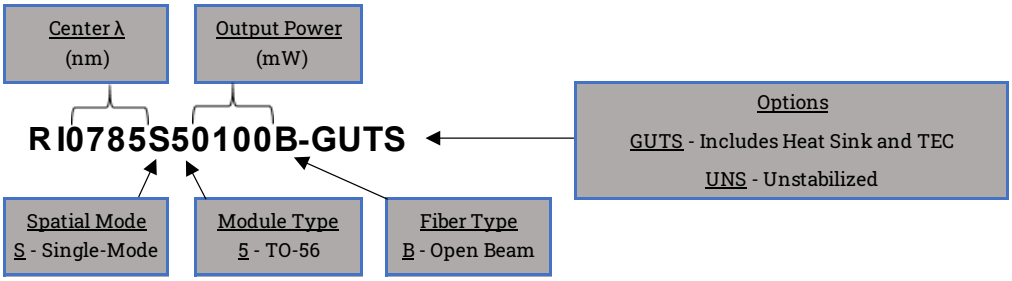
Specifications

Wavelength Tolerance	+/- 0.5 nm
Spectral Linewidth	~100kHz* Instantaneous
Wavelength Stability Range	15° C - 45° C
SMSR	35 - 45 dB
SMSR w/integral laser line filter	70 dB
Power Stability	1% typical
Beam Exit Angle	< 3°
Beam Quality ($M^2/1/e^2$)	< 1.2
Beam Ellipticity	< 1:5:1
Polarization Extinction Ratio (PER)	>17 db
Polarization Orientation	Parallel to V-notches
Beam Divergence (Typical)	~ 2 mrad ~ 4 mrad for 785nm
Spatial Profile	TEM00

*Requires driver electronics with very low noise analog laser driver along with a design for dual TECs for improved temperature control. Refer to the Linewidth White Paper on our website for further details

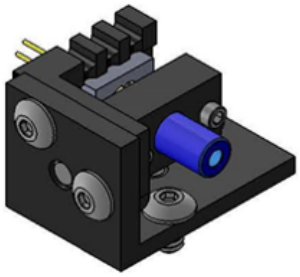
λ (nm)	Output Power (mW)	Base Part Number	Max Current, Voltage
633	50	RI0633S50050B	175 mA, 3.0V
638	60	RI0638S50060B	250mA, 3.2V
660	60	RI0660S50060B	175mA, 3.3V
685	40	RI0685S50040B	60 mA, 3.0V
780	100	RI0780S50100B	220mA, 3.3V
783	100	RI0783S50100B	200mA, 2.2V
785	100	RI0785S50100B	200mA, 2.2V
	150	RI0785S50150B	400mA, 3.0V
808	150	RI0808S50150B	400mA, 3.0V
830	150	RI0830S50150B	500mA, 2.2V
852	150	RI0852S50150B	500mA, 2.2V
976	150	RI0976S50150B	500mA, 2.2V
1053	150	RI1053S50150B	500mA, 2.2V
1064	150	RI1064S50150B	500mA, 2.2V

Part Schema



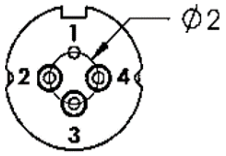
GUTS Package

A Convenient Method
For Heat Sinking Your Laser



Designed to meet customer demand for a suitable mount for IPS' TO-56, the GUTS package offers a low footprint heat sink/mounting solution that uses a compression block to mount the TO-56 to both TEC and heat sink fixture. Manipulation of the screws on the fixture can steer the output beam to obtain desired beam pointing.

TO-56 Pin Out



Pin 1	LD Anode (+), Case Ground
Pin 2	LD Cathode (-)
Pin 3	Thermistor (10 kOhm @ 25°C) *
Pin 4	Thermistor

*Integral Thermistor: GA10K3CG1231

S8060-4

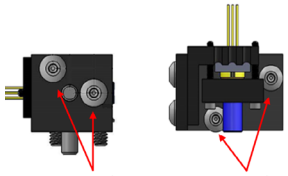
IPS strongly recommends against soldering directly to the TO-Can leads as this can result in early device failure. Instead, IPS recommends the use of a push-on laser diode socket similar to P/N: S8060-4 offered by Thorlabs.

If soldering must be performed, then IPS recommends a solder temperature of < 150°C with the shortest solder time possible.
Our lowest solder melting temperature inside the package is ~ 200°C.
The curing temperature of the TO-can lid epoxy is ~ 100°C.
There are In-Sn-based solder alloys with temperatures below 200°C, see for example:

- 58% Sn 42% In has a melting temperature of 145°C
- 52% Sn 48% In has a melting temperature of 131°C
- 50% Sn 50% In has a melting temperature of 125°C

GUTS 2-Axis Alignment

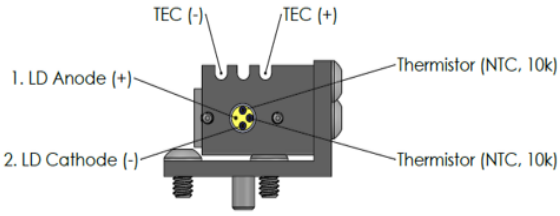
Using a 1/16" driver to adjust the screws located on the side or bottom of the GUTS package, the user can pivot the mount around its respective dowel pin.



Y-Axis Adjustment | X-Axis Adjustment

This adjustment allows control of the beam's direction along both the horizontal (X) and vertical (Y) axes.

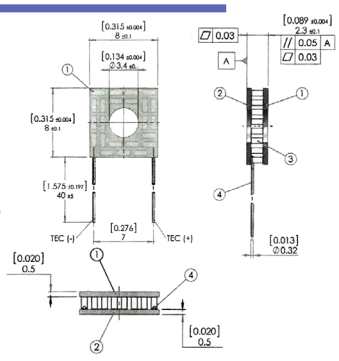
GUTS Pin Out



BACK VIEW

GUTS TEC

Optimal performance of IPS' single-mode product line requires careful temperature control to maintain wavelength accuracy and stability. The Peltier TEC included in the GUTS package allows the leads to pass through, providing excellent thermal contact between the base of the TO-Can and the TEC.



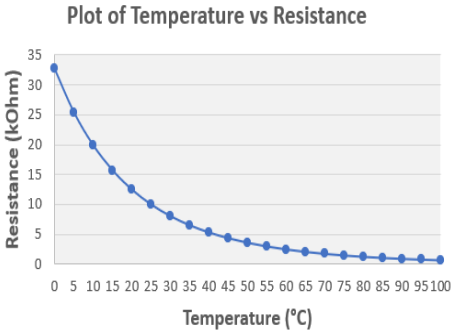
Dimensions in [ ] are in INCHES.

Parameter	Units	Value	Notes
AC Resistance, ACR	Ohm	1.58 ± 0.07	At T_{amb}=300K
Current, I_{max}	A	1.30 ± 0.07	At ΔT_{max}
Voltage Drop, U_{max}	V	3.00 ± 0.15	
Delta-T, ΔT_{max}	K	71.00 ± 2.00	In vacuum, Q=0, T_{amb}=300K
Cooling Capacity, Q_{max}	W	2.50 ± 0.13	At ΔT=0
TEC Figure-of-Merit, Z*1000	K^{-1}	2.81 ± 0.12	
TEC Time Constant, τ	sec	1.97 ± 0.29	At I=0.01 I_{max} – at I=13mA

TEC performance data is specified at $T_{hot} = T_{amb}$. TEC ACR value is for reference only.

Thermistor Calibration

Temperature (°C)	Resistance (kOhm)
100	0.678
95	0.787
90	0.916
85	1.071
80	1.256
75	1.480
70	1.752
65	2.082
60	2.487
55	2.985
50	3.601
45	4.367
40	5.325
35	6.530
30	8.056
25	10.000
20	12.493
15	15.714
10	19.903
5	25.395
0	32.651



Performance Specifications

Parameters	Units	Value
Resistance @ +25°C	Ohms	10,000
Resistance Tolerance +25°C	%	± 1
Beta Value 25/85	K	3976
Dissipation Constant	mW/°C	≥ 0.25

Formula for calculating Temperature based upon Resistance:

$1/(1.13e^{-3}+2.34e^{-4}*LN(kOhm*1000)+8.78e^{-8}*(LN(kOhm*1000))^3)-273.15$

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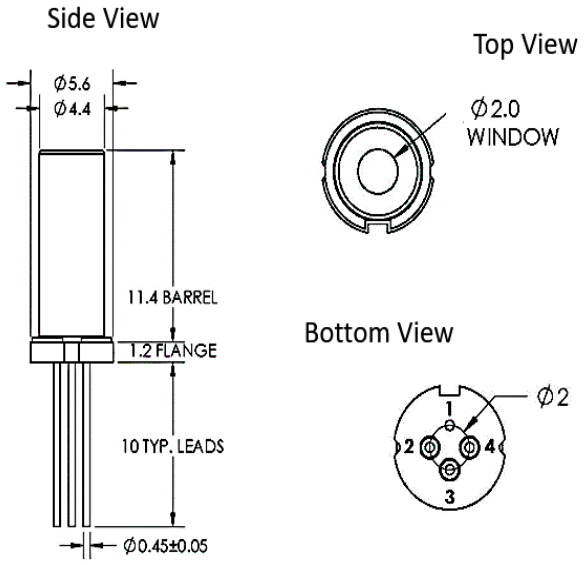
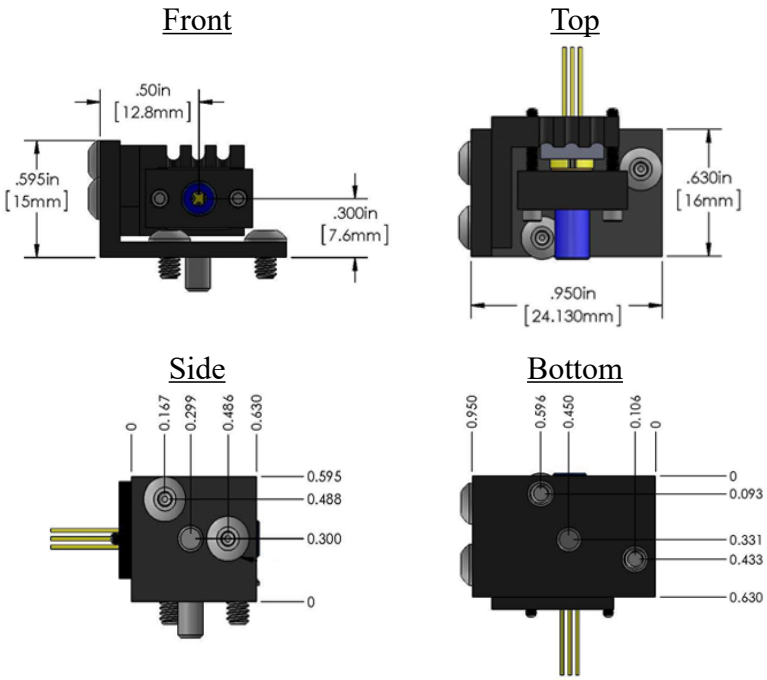
Mechanical Drawings

TO-56 Drawing



GUTS Package Drawing



Operational Notes

1. Laser and TEC driver circuitry should be configured in a manner to prevent power /current / voltage surges and spikes.
2. Laser must be compression mounted on a Thermo-Electric Cooler (TEC) and heat sink to guarantee wavelength stable performance.
3. **Warning: Do not retro-reflect beam!** Back reflections are the leading cause of Catastrophic Optical Damage (COD) and damage to the laser facet due to COD is not covered under warranty. Reflected light can also cause destabilizing effects, such as mode hopping, frequency fluctuations, intensity variations, and increased noise. For this reason, IPS recommends the inclusion of an optical isolator with > 20 dB of isolation. An optical isolator acts as a one way valve for light, helping to reduce the back reflections to the system. For more information on this topic please review our white paper: Single-Mode Semiconductor Lasers and Optical Isolators.
4. IPS recommends against soldering directly to the leads of the TO-Can as this may result in early device failure.
5. Laser will operate in single frequency mode at specific temperature windows between 15°C-45°C, however, optimal operating set points and ranges must be determined for each laser diode to avoid mode hops (see Note 6). Additionally, lasers < 700 nm typically have a smaller operational temperature range due to higher facet coatings.
6. To determine optimal operating point, plot wavelength vs temperature and wavelength vs. current to determine where mode-hop locations are. Set operating temperature and current halfway between mode-hops. This will ensure the most stable operation (See our white paper: Mode Hops with VBG Stabilized Single-Mode Lasers for more details).
7. OEM Laser Product: This laser module is designed for use as a component (or replacement) part and is thereby exempt from 21 CFR1040.10 and 1040.11 provisions.
8. For more information on REACH, RoHS, and Conflict Minerals, please refer to IPS' Compliance Declaration Statement.