EYP-DFB-0852-00010-1500-BFY12-0005

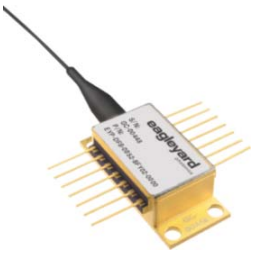
Revision 0.71

2019-08-01

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
852 nm DFB Laser	Spectroscopy (Cs D2 line)
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Atomic Clock
with PM Fiber, integrated µ-Isolator and Angled Physical Contact (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-15		70	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			20	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	5		60	
Operational Temperature at Laser Chip	T_{LD}	°C	15		45	measured by integrated Thermistor
Forward Current	I_F	mA			190	
Output Power	P_{opt}	mW	3		10	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Target Wavelength	λ_T	nm		852.347		reached within T_{LD} = 15 ° ... 45° C at 10 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		0.6	1	
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	25			> 10 GHz, at target wavelength
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 10 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 10 mW	I_{LD}	mA			190	exfiber
Slope Efficiency	η	W / A		0.08		
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 10 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	3		100	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 10 mW, ΔT =30 K
Voltage	U_{TEC}	V		1.5		P_{opt} = 10 mW, ΔT =30 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 10 mW, ΔT =30 K
Temperature Difference	ΔT	K			45	P_{opt} = 10 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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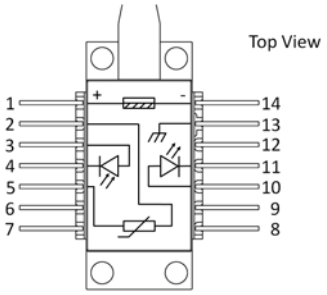
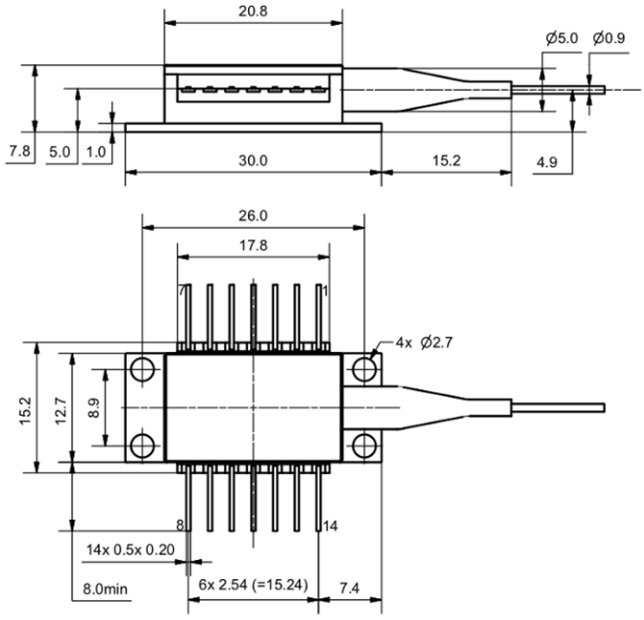
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

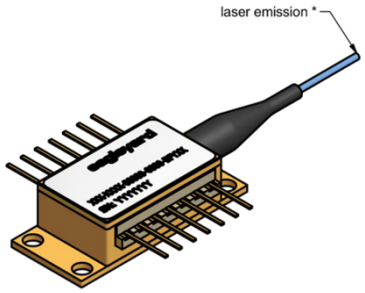
1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected



Package Drawings



AIZ-16-0222-1415



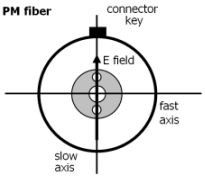
Caution. Excessive mechanical stress on the package can lead to a damage of the laser.

See instruction manual on www.eagleyard.com

Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	FC/APC (narrow key / 2mm)

Measurement Conditions / Comments



DATA SHEET

EYP-DFB-0852-00010-1500-BFY12-0005

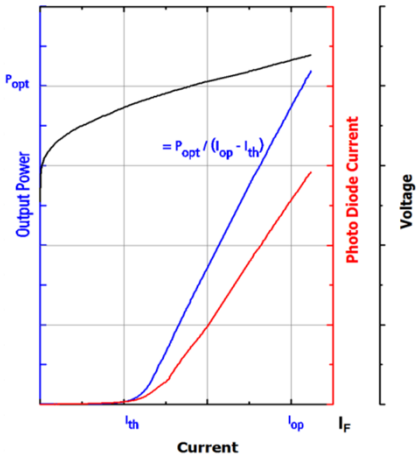
Revision 0.71

2019-08-01

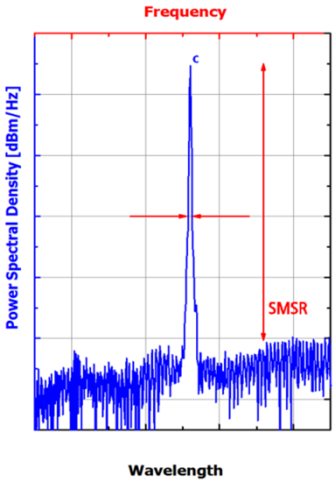
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.

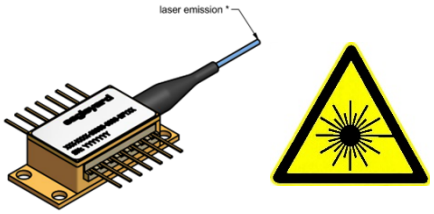
Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.



INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 852 nm
MAX. OUTPUT POWER 20 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
:0 mW MAX OUTPUT AT 852 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-0852-00050-1500-BFY02-0000

Revision 1.09

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
852 nm DFB Laser	Spectroscopy
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	
with PM Fiber and angle-polished Connector (APC)	

Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			55	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C		25		measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW		50		

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		50 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 50 mW

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Revision 1.09

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.2	0.5	0.7	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 50 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 50 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 50 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 50 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 50 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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Revision 1.09

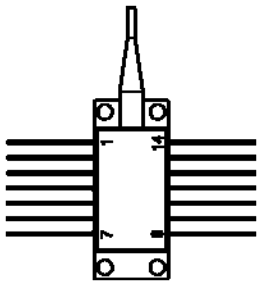
2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

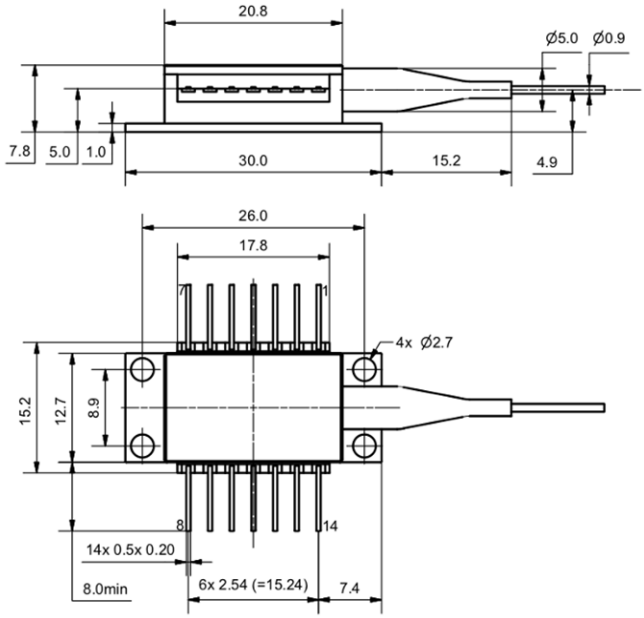
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

All 14 pins are isolated from case.



Package Drawings



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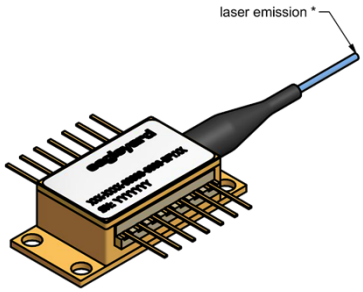
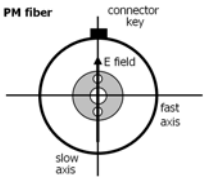


Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	different variants available

Measurement Conditions / Comments



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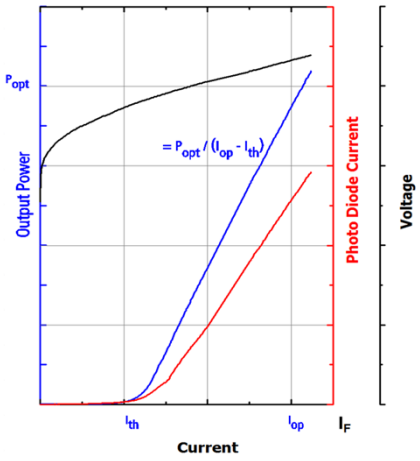
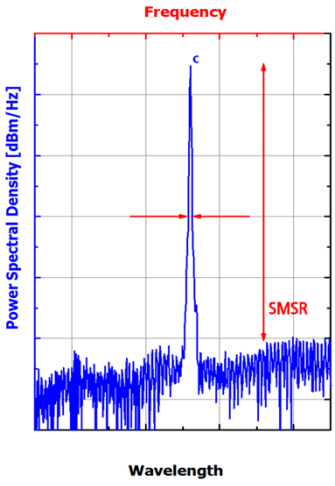
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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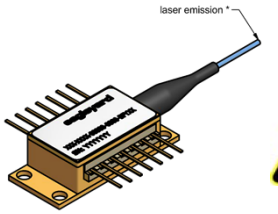
Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.



INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 852 nm
MAX. OUTPUT POWER 55 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
55 mW MAX OUTPUT AT 852 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-0852-00050-1500-BFY02-0002

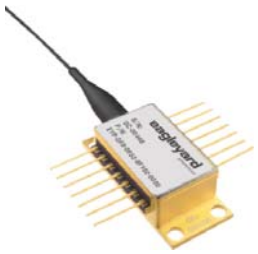
Revision 1.09

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 852 nm DFB Laser	Spectroscopy
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	
with PM Fiber and angle-polished Connector (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			55	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		45	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	10		50	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		see note 1)
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		see note 1)
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 50 mW

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2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	Temperature at Laser Chip
Mode-hop free Power Range	P_{opt}	mW	10		50	
Laser Current @ P_{opt} = 50 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.2	0.5	0.7	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 50 mW

1) This variant allows wavelength tuning by temperature or current variation; in case of external backreflections small mode-hops of 100 MHz or less may appear; the use of a BFW01 or TOC03 package variants and effective optical isolation is recommended for spectroscopic application requiring absolutely mode-hop-free tuning.

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 50 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 50 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 50 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 50 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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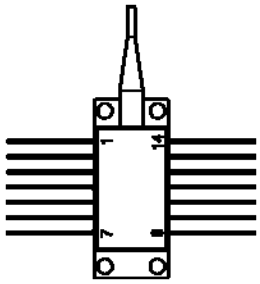
2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

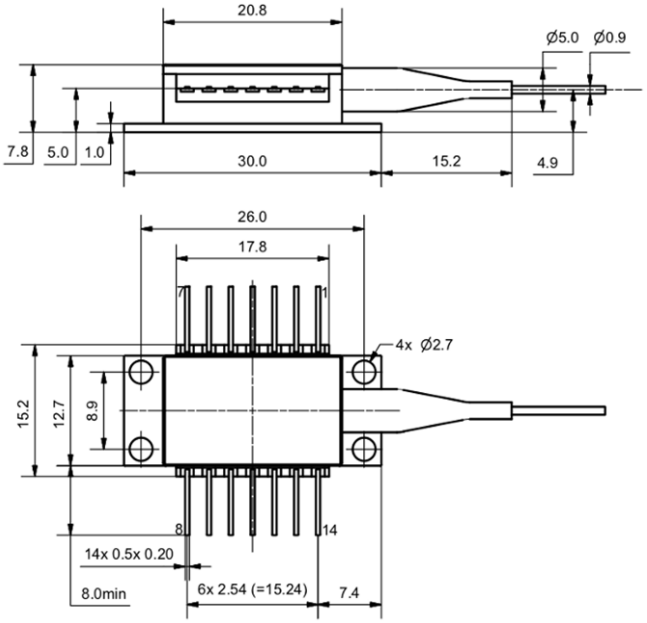
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

All 14 pins are isolated from case.



Package Drawings



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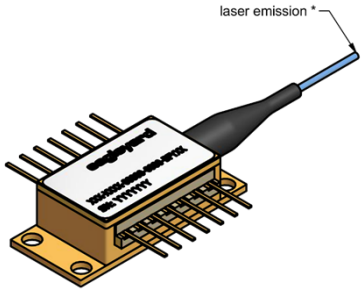
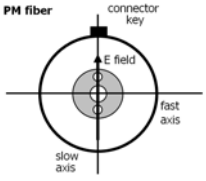


Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	different variants available

Measurement Conditions / Comments



EYP-DFB-0852-00050-1500-BFY02-0002

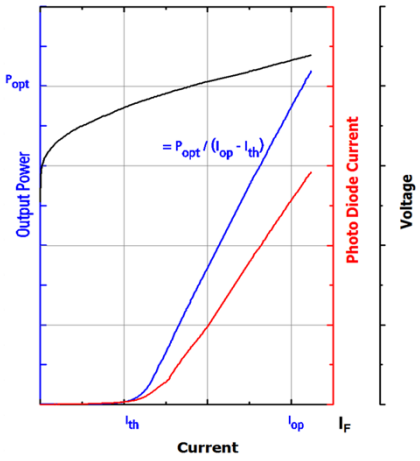
Revision 1.09

2017-03-02

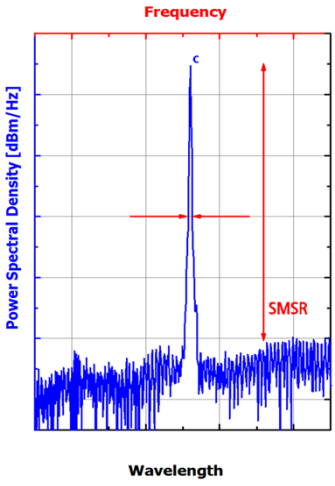
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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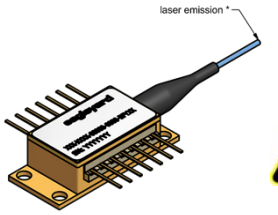


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 852 nm
MAX. OUTPUT POWER 55 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
55 mW MAX OUTPUT AT 852 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-0852-00100-1500-BFW01-0002

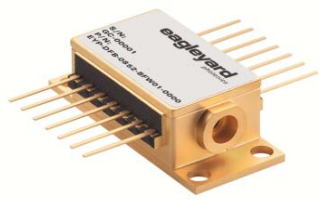
Revision 0.90

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 852 nm DFB Laser	Spectroscopy
with hermetic 14 Pin-Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	THz Generation
with integrated Beam Collimation	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			110	
TEC Current	I_{TEC}	A			1.1	
TEC Voltage	V_{TEC}	V			2.8	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		45	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		100	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Sidemode Supression Ratio	SMSR	dB	30	50		P_{opt} = 100 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		

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Revision 0.90

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	Temperature at Laser Chip
Mode-hop free Power Range	P_{opt}	mW	20		100	
Laser Current @ P_{opt} = 100 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		0.1		parallel to the base plate of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		0.1		perpendicular to base plate of the housing (see p. 3)
Beam Diameter horizontal (1/e²)	$d_{\parallel}$	mm		1.0	1.2	parallel to the base plate of the housing (see p. 3)
Beam Diameter vertical (1/e²)	$d_{\perp}$	mm		0.8	1.2	perpendicular to base plate of the housing (see p. 3)
Degree of Polarization	DOP	%		90		P_{opt} = 100 mW; E field parallel to the base plate

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.5		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 100 mW, ΔT = 20 K
Voltage	U_{TEC}	V		1.3		P_{opt} = 100 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.4		P_{opt} = 100 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 100 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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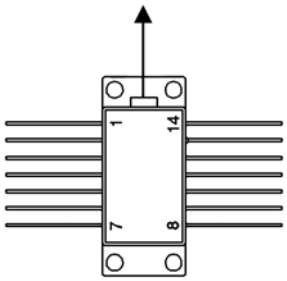
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

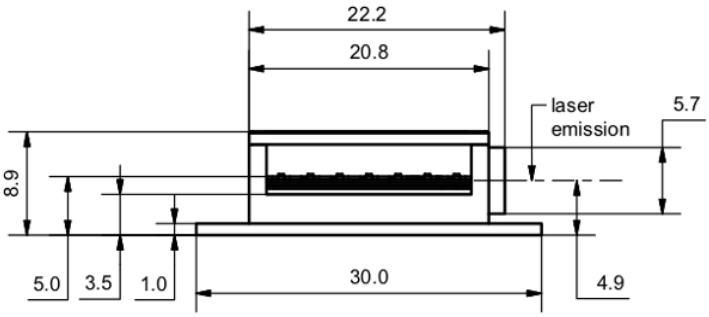
1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

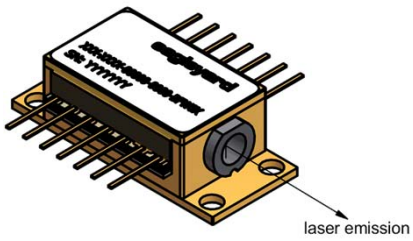
All 14 pins are isolated from case.

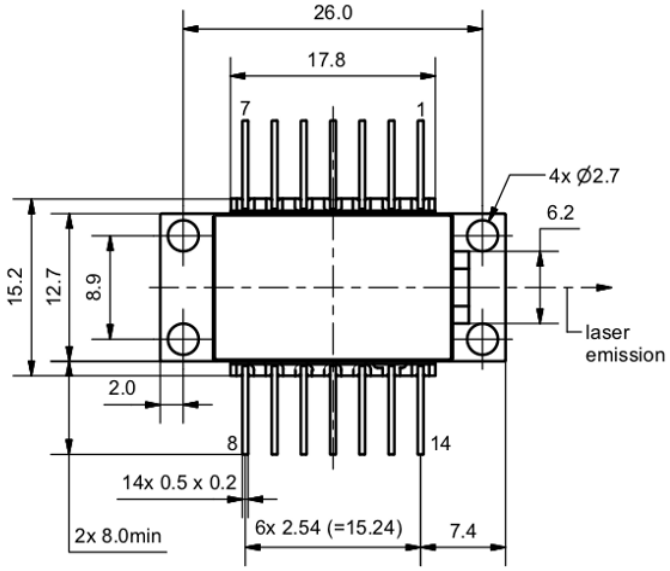
top view



Package Drawings







AIZ-15-0729-0947

DATA SHEET

EYP-DFB-0852-00100-1500-BFW01-0002

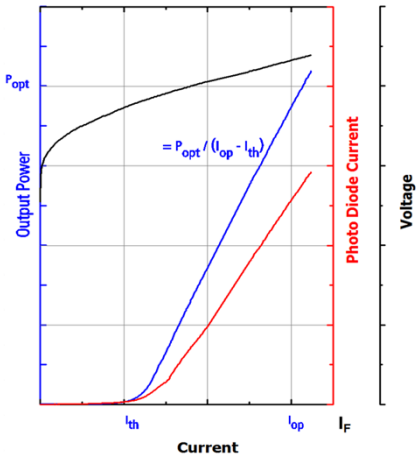
Revision 0.90

2017-03-02

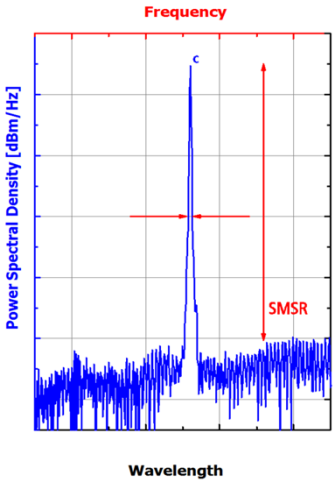
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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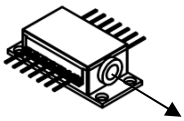


Laser Emission

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-0852-00100-1500-BFW01-0005

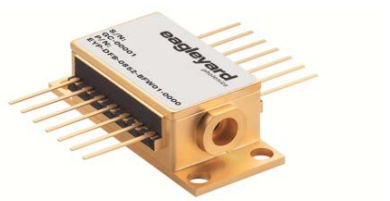
Revision 0.90

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
852 nm DFB Laser	Spectroscopy (Cs D2 line)
with hermetic 14 Pin-Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Atomic Clock
with integrated Beam Collimation	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			110	
TEC Current	I_{TEC}	A			1.1	
TEC Voltage	V_{TEC}	V			2.8	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		45	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		100	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Target Wavelength	λ_T	nm		852.347		reached within T_{LD} = 15 ° ... 45° C at 100 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		0.6	1	
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	25			> 10 GHz, at target wavelength
Sidemode Supression Ratio	SMSR	dB	30	50		P_{opt} = 100 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		

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Revision 0.90

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 100 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		0.1		parallel to the base plate of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		0.1		perpendicular to base plate of the housing (see p. 3)
Beam Diameter horizontal	$d_{\parallel}$	mm		1.0	1.2	parallel to the base plate of the housing (see p. 3)
Beam Diameter vertical	$d_{\perp}$	mm		0.8	1.2	perpendicular to base plate of the housing (see p. 3)
Degree of Polarization	DOP	%		90		P_{opt} = 100 mW; E field parallel to the base plate

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.5		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 100 mW, ΔT = 20 K
Voltage	U_{TEC}	V		1.3		P_{opt} = 100 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.4		P_{opt} = 100 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 100 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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Revision 0.90

2017-03-02

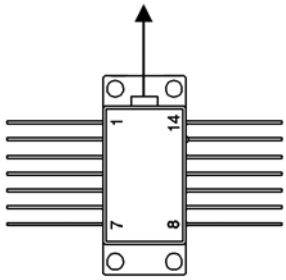
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

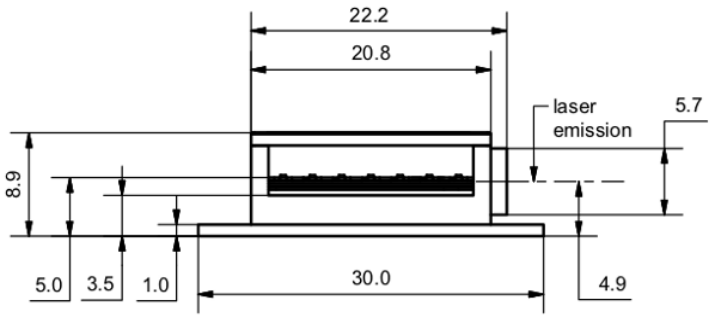
1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

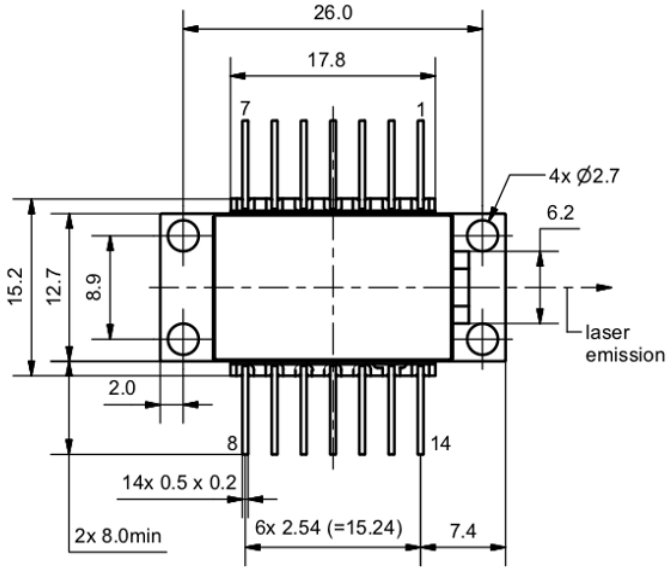
All 14 pins are isolated from case.

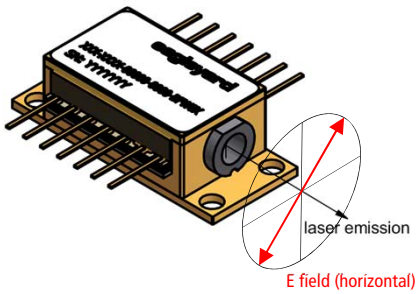
top view



Package Drawings







E field (horizontal)

AIZ-15-0729-0947

EYP-DFB-0852-00100-1500-BFW01-0005

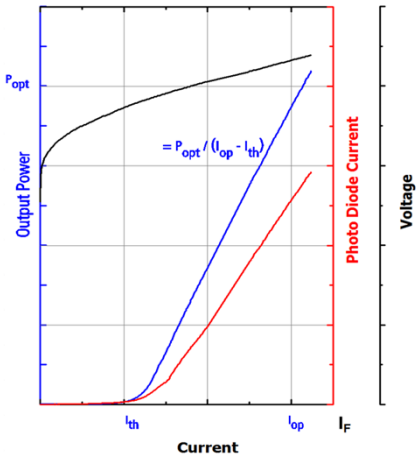
Revision 0.90

2017-03-02

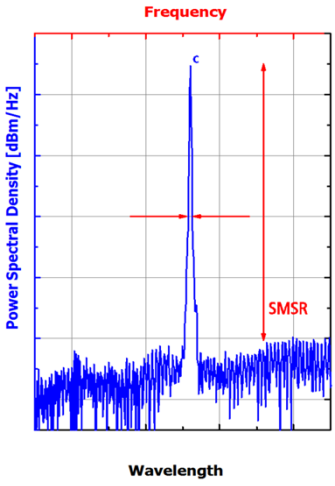
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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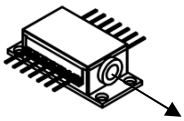
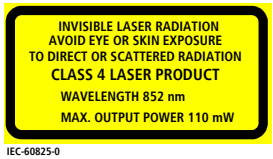


Laser Emission



IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-0852-00150-1500-TOC03-0000

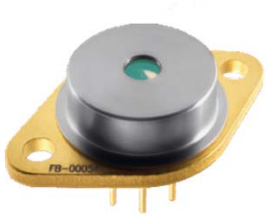
Revision 1.07

2018-06-28

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
852 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	THz Generation



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		50	
Forward Current	I_F	mA			270	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			160	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	measured by integrated Thermistor
Forward Current	I_F	mA			250	
Output Power	P_{opt}	mW	30		150	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 150 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 150 mW	I_{LD}	mA			250	
Slope Efficiency	η	W / A	0.6	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		150 mW; E field perpendicular to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 150 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 150 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 150 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 150 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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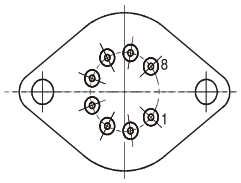
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

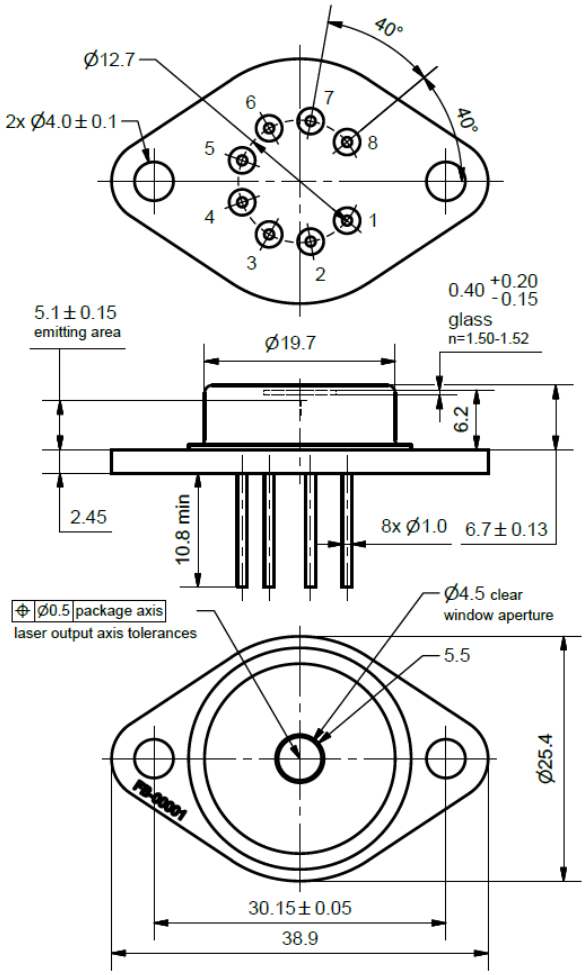
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view



Package Drawings



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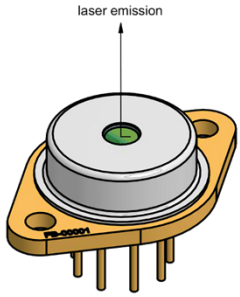
laser emission



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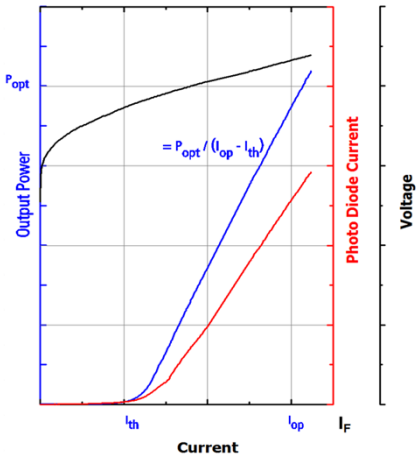
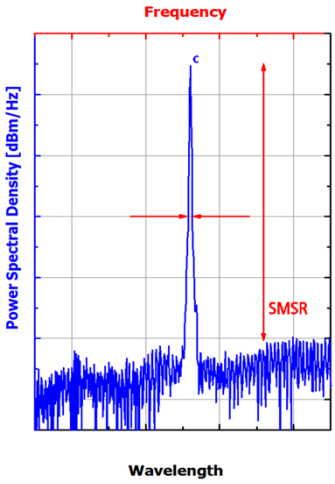
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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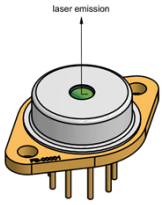

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 852 nm
MAX. OUTPUT POWER 160 mW

IEC-60825-0

DANGER

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
160 mW MAX OUTPUT AT 852 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

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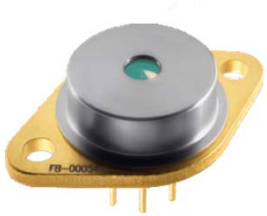
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 852 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	THz Generation



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		50	
Forward Current	I_F	mA			270	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			160	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	measured by integrated Thermistor
Forward Current	I_F	mA			250	
Output Power	P_{opt}	mW	30		150	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 150 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	Temperature at Laser Chip
Mode-hop free Power Range	P_{opt}	mW	30		150	
Laser Current @ P_{opt} = 150 mW	I_{LD}	mA			250	
Slope Efficiency	η	W / A	0.6	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		150 mW; E field perpendicular to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 150 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 150 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 150 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 150 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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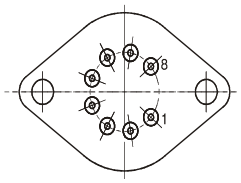
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

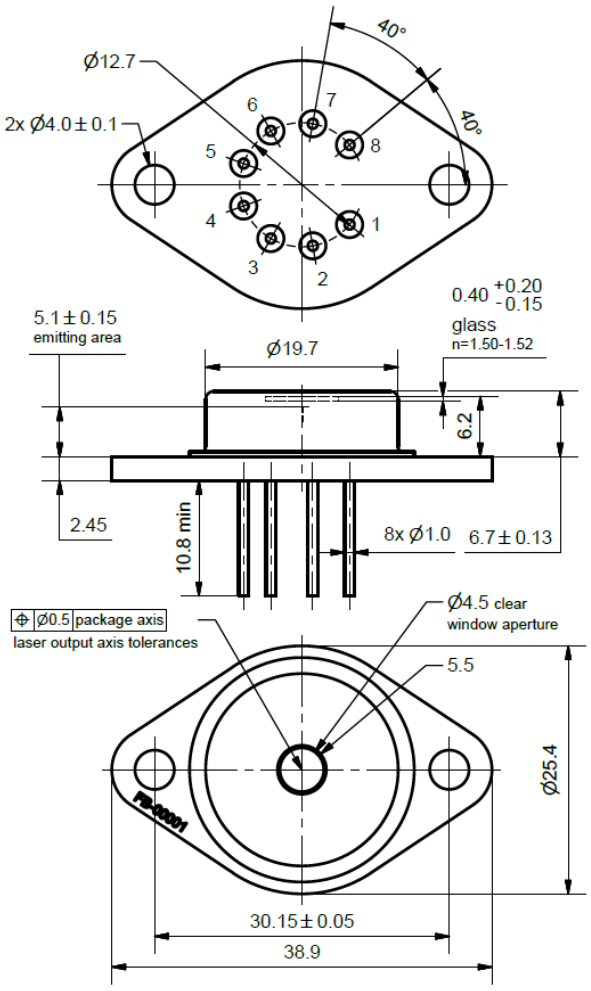
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

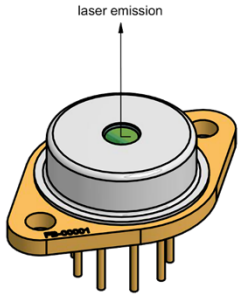


Package Drawings



AIZ-16-311-1543-B

laser emission



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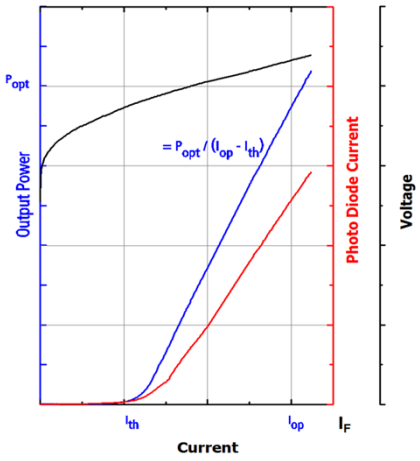
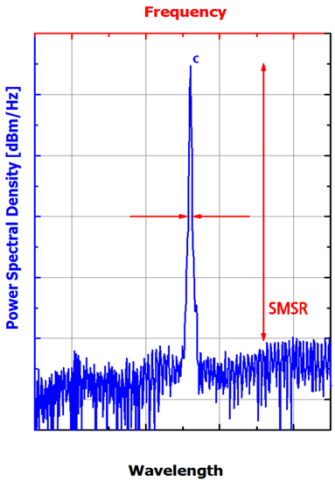
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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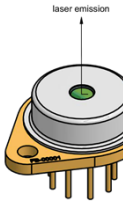

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

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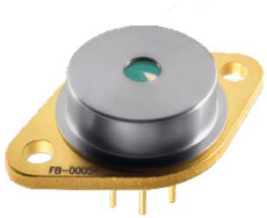
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
852 nm DFB Laser	Spectroscopy (Cs D2 line)
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	THz Generation
	Atomic Clock



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		50	
Forward Current	I_F	mA			270	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			160	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	measured by integrated Thermistor
Forward Current	I_F	mA			250	
Output Power	P_{opt}	mW	30		150	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	851	852	853	see images on page 4
Target Wavelength	λ_T	nm		852.347		reached within T_{LD} = 15 ° ... 45° C at 150 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		0.6	1	
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 150 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	25			> 10 GHz, at target wavelength

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 150 mW	I_{LD}	mA			250	
Slope Efficiency	η	W / A	0.6	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		P_{opt} = 150 mW; E field perpendicular to long axis of hou

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 150 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 150 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 150 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 150 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
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Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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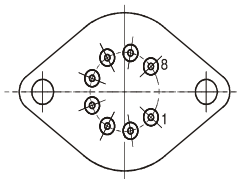
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

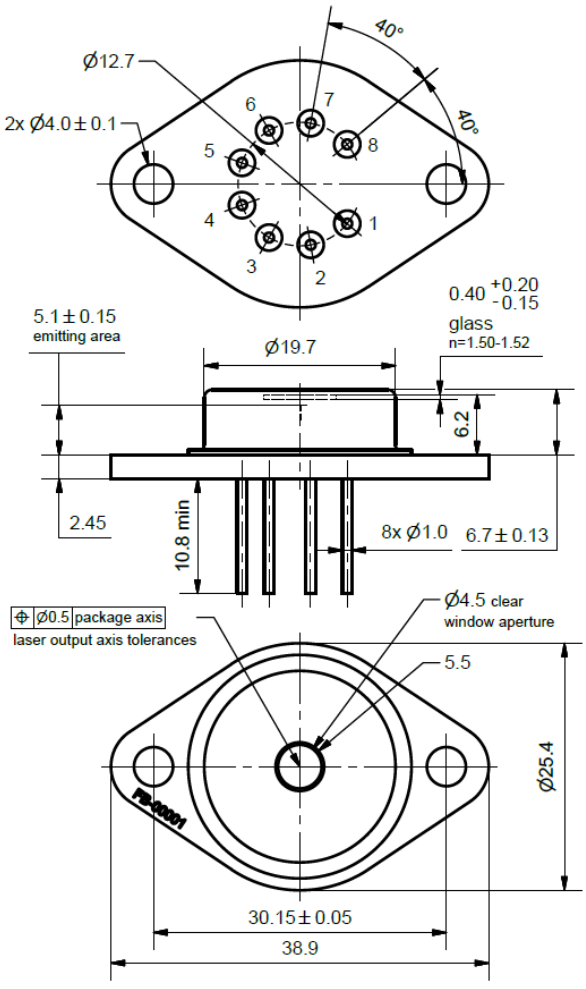
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view



Package Drawings



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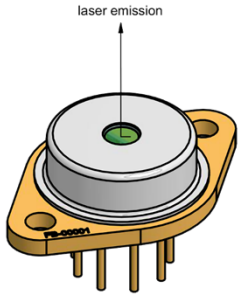
laser emission



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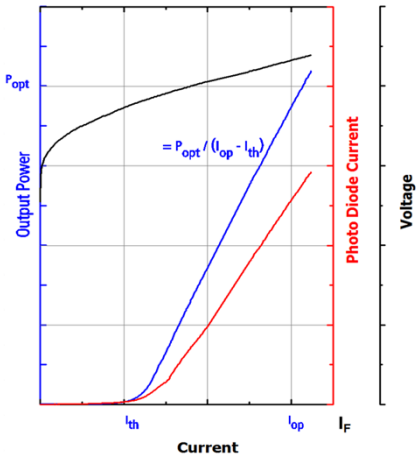
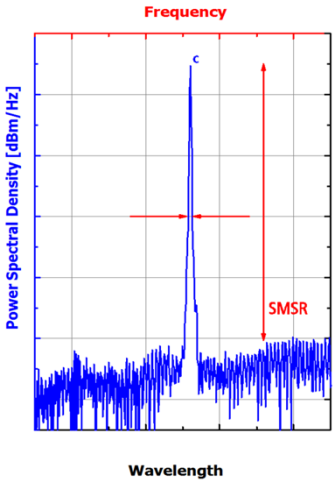
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

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The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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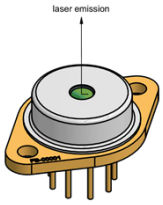
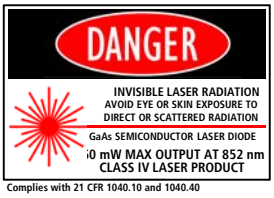


IEC-60825-0



Complies with 21 CFR 1040.10 and 1040.40

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EYP-DFB-0922-00080-1500-TOC03-0000

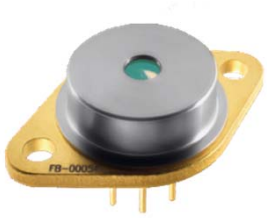
Revision 0.91

2018-10-16

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 922 nm DFB Laser	Metrology
with hermetic 8-Pin TO Package (RoHS compliant)	
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		60	
Operational Temperature at Laser Chip	T_{LD}	°C	0		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			100	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		55	
Operational Temperature at Laser Chip	T_{LD}	°C	5		40	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	922	922	923	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			150	
Slope Efficiency	η	W / A	0.5	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		95		80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	t.b.d.		t.b.d.	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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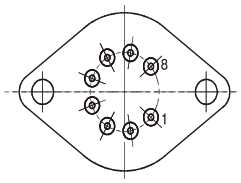
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

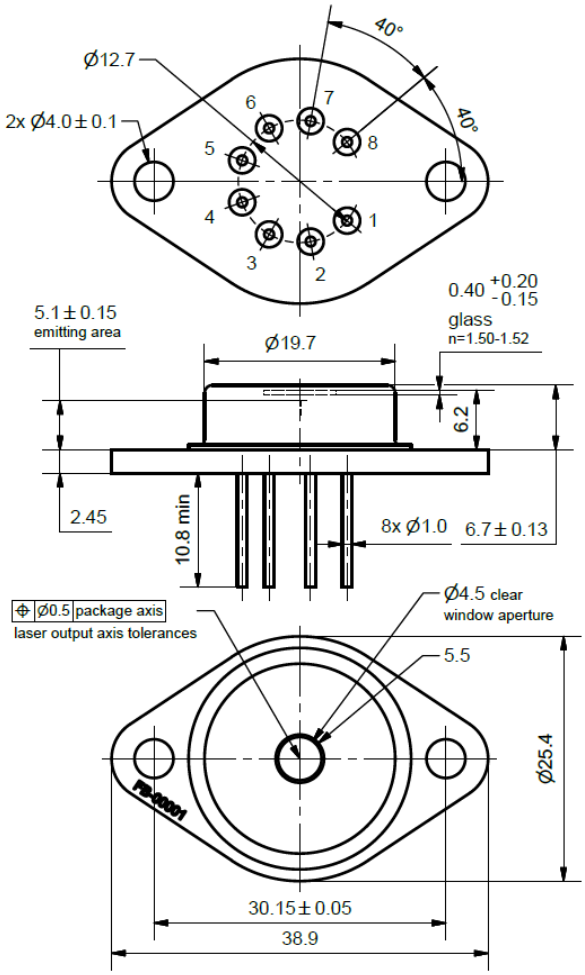
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

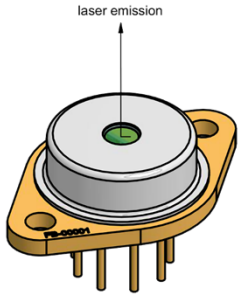


Package Drawings



AIZ-16-311-1543-B

laser emission



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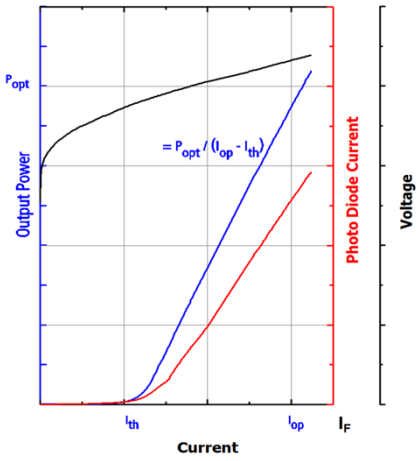
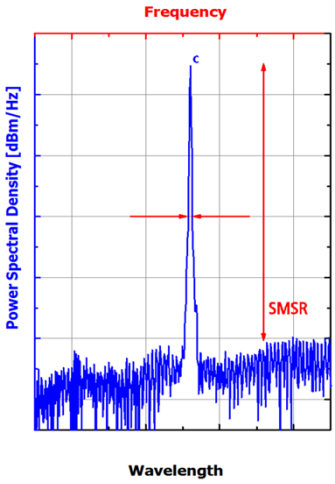
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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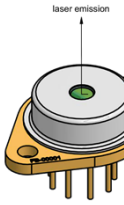

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 922 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
90 mW MAX OUTPUT AT 922 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

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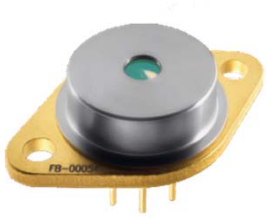
Revision 0.91

2018-10-16

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 922 nm DFB Laser	Metrology
with hermetic 8-Pin TO Package (RoHS compliant)	
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		60	
Operational Temperature at Laser Chip	T_{LD}	°C	0		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			100	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		55	
Operational Temperature at Laser Chip	T_{LD}	°C	5		40	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	922	922	923	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 80 mW
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	20		80	
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			150	
Slope Efficiency	η	W / A	0.5	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		95		80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	t.b.d.		t.b.d.	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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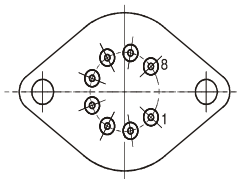
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

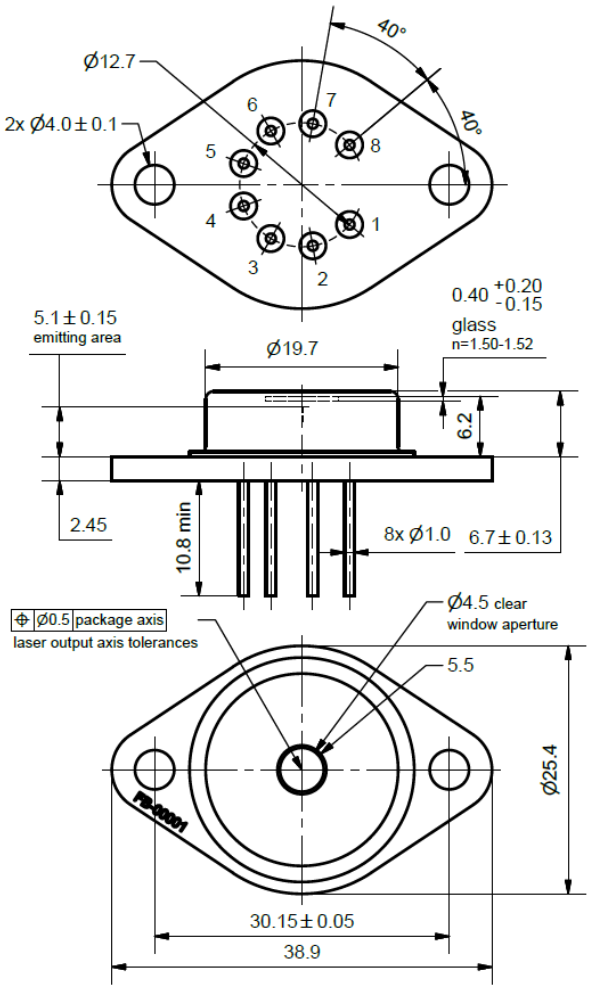
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

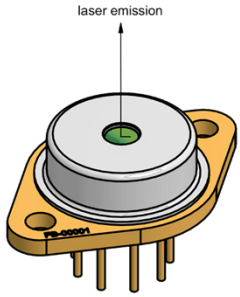


Package Drawings



AIZ-16-311-1543-B

laser emission



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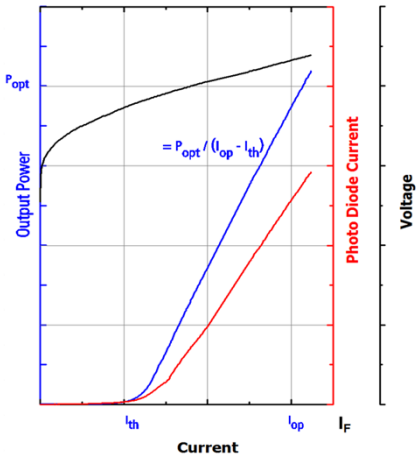
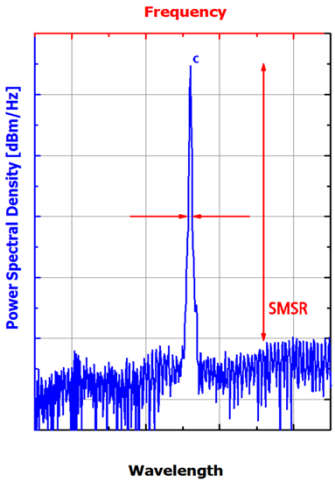
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

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The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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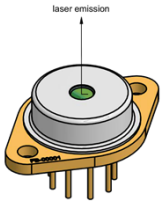

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 922 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
90 mW MAX OUTPUT AT 922 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

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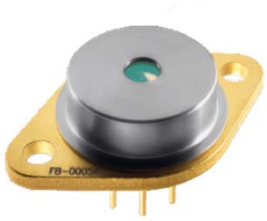
Revision 0.91

2018-10-16

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
922 nm DFB Laser	Sr Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		60	
Operational Temperature at Laser Chip	T_{LD}	°C	0		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			100	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		55	
Operational Temperature at Laser Chip	T_{LD}	°C	5		40	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	921	922	923	see images on page 4
Target Wavelength	λ_T	nm		921.7		reached within T_{LD} = 0 ° ... 40° C at 80 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		1	2	P_{opt} = 80 mW
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	30			> 10 GHz, at target wavelength

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			150	
Slope Efficiency	η	W / A	0.5	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		95		P_{opt} = 80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	t.b.d.		t.b.d.	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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Revision 0.91

2018-10-16

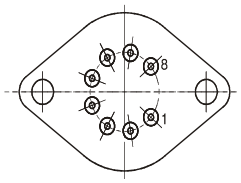
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

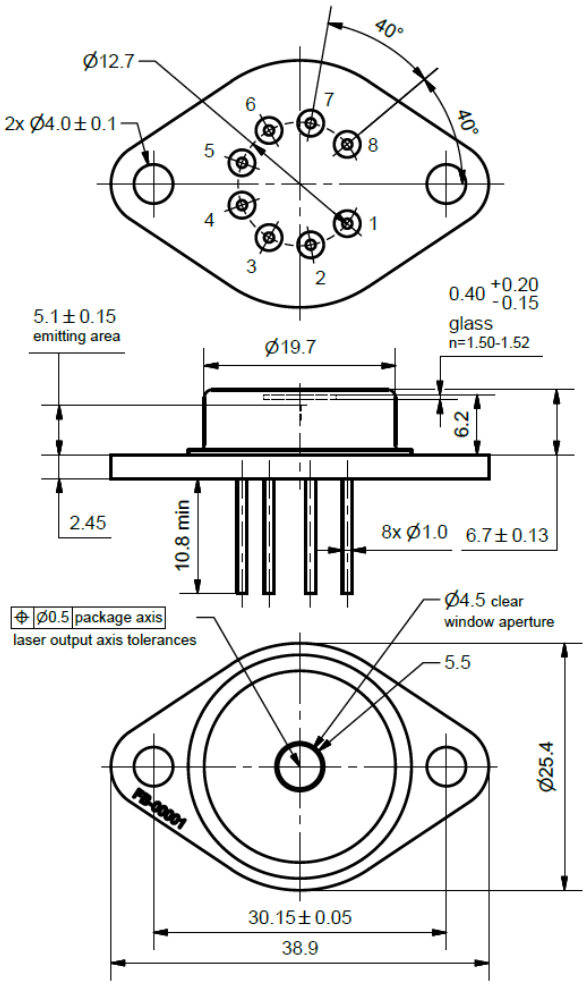
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

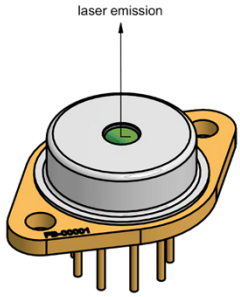


Package Drawings



AIZ-16-311-1543-B

laser emission



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EYP-DFB-0922-00080-1500-TOC03-0005

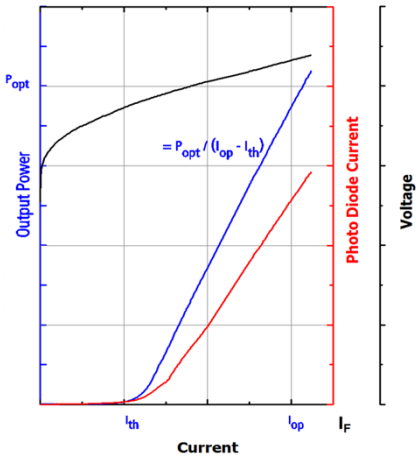
Revision 0.91

2018-10-16

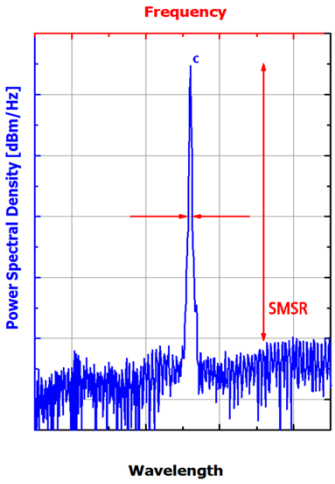
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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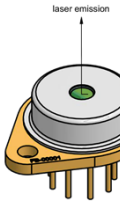
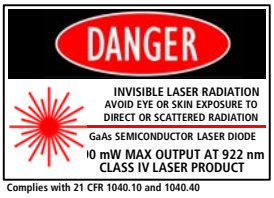


IEC-60825-0



Complies with 21 CFR 1040.10 and 1040.40

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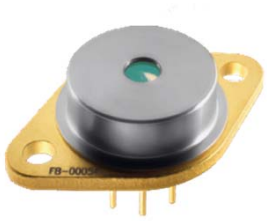
Revision 0.91

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
935 nm DFB Laser	Yb Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		45	
Operational Temperature at Laser Chip	T_{LD}	°C	-10		45	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		40	
Operational Temperature at Laser Chip	T_{LD}	°C	-5		40	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	934	935	937	see images on page 4
Target Wavelength	λ_T	nm		935,18		reached within T_{LD} = -5 ° ... 40° C at 80 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		0,6	1	
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0,06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0,003		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	100			at target wavelength

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0,5	0,8	1,1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0,5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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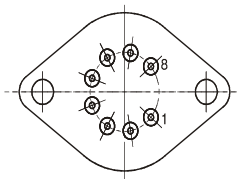
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

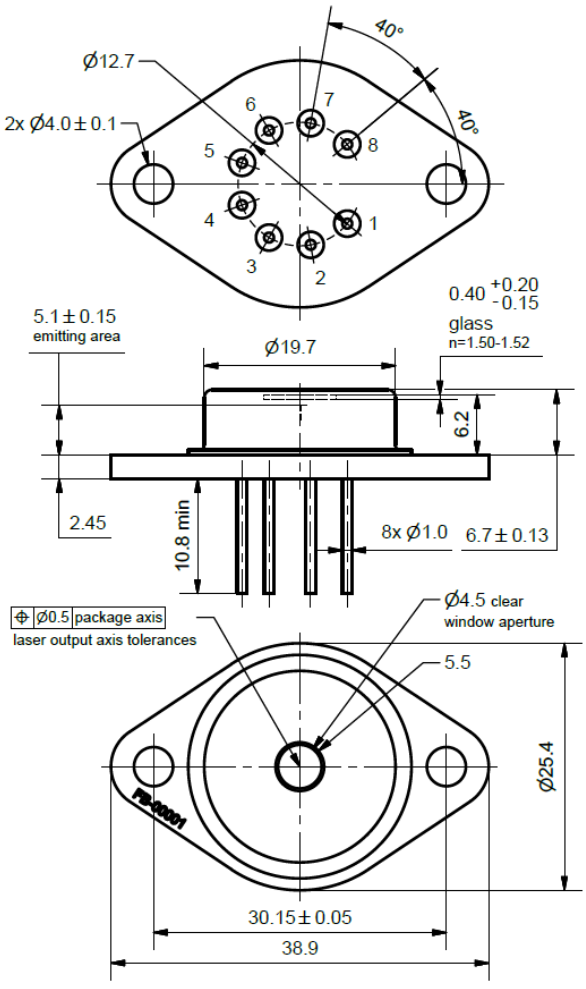
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

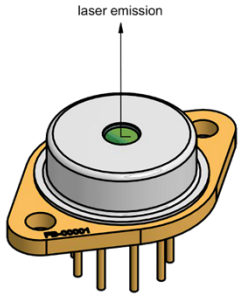


Package Drawings



AIZ-16-311-1543-B

laser emission



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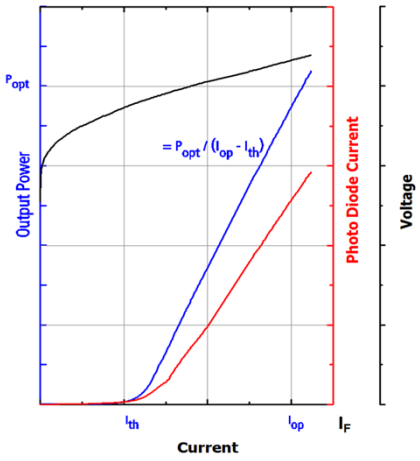
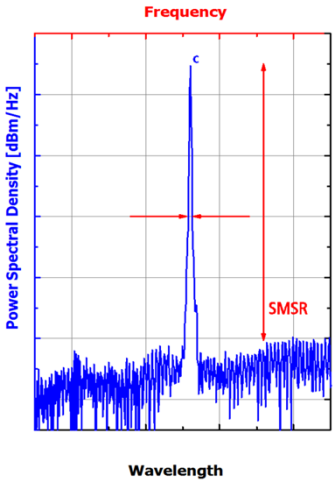
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

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The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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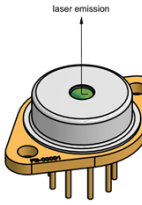


IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

eagleyard photonics

EYP-DFB-0935-00080-1500-TOC03-0005

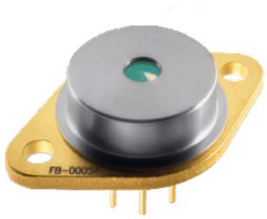
Revision 0.94

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
935 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	934	935	937	see images on page 4
Target Wavelength	λ_T	nm		935.7		reached within T_{LD} = 0 ° ... 45° C at 80 mW
Linewidth (FWHM)	$\Delta\lambda$	MHz		0.6	1	
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm	100			at target wavelength

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.5	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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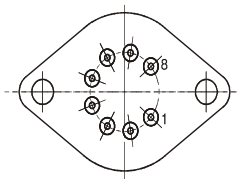
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

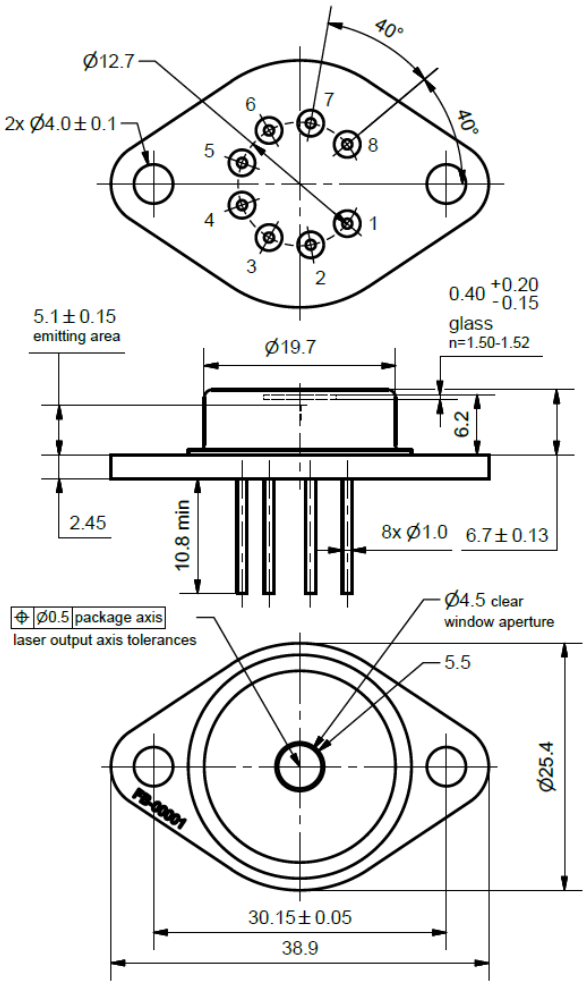
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

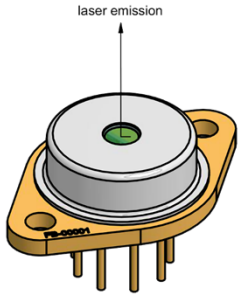


Package Drawings



AIZ-16-311-1543-B

laser emission



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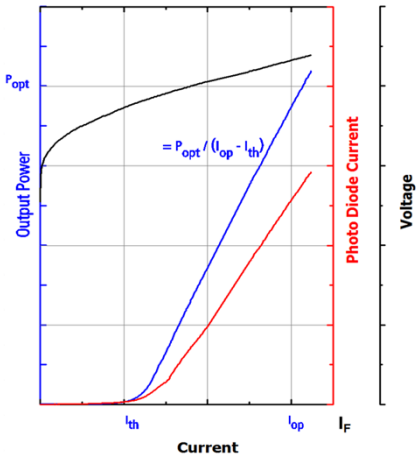
Revision 0.94

2018-03-02

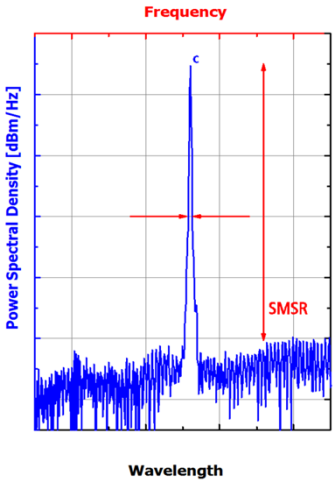
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

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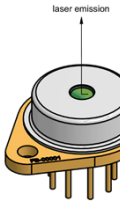


IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-0935-00080-1500-TOC03-0002

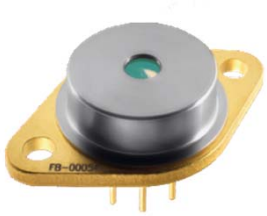
Revision 0.94

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 935 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	934	935	937	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	20		80	
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.5	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to short axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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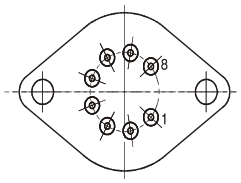
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

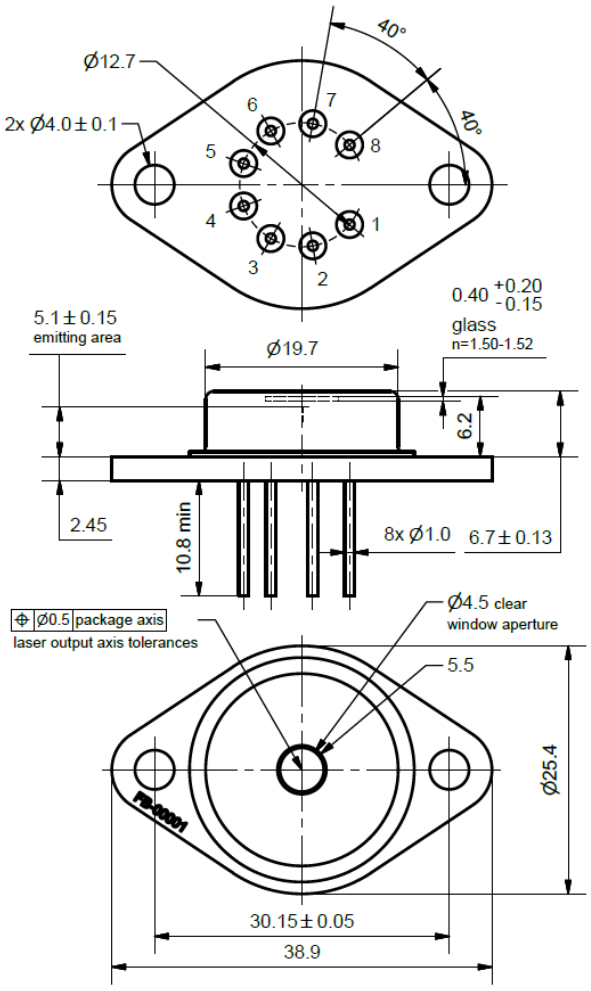
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

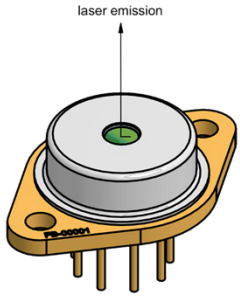


Package Drawings



AIZ-16-311-1543-B

laser emission



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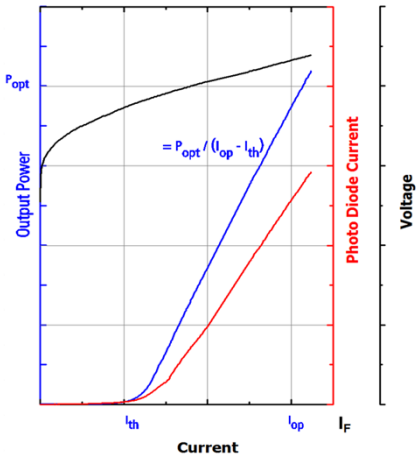
2018-03-02

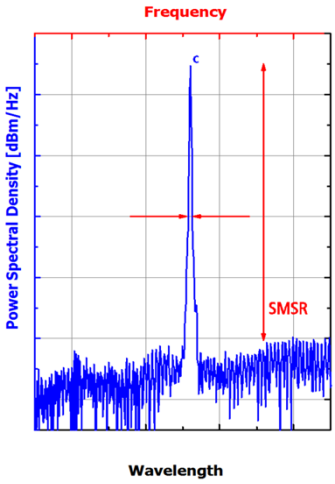
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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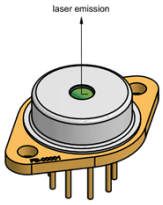

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 935 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
90 mW MAX OUTPUT AT 935 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

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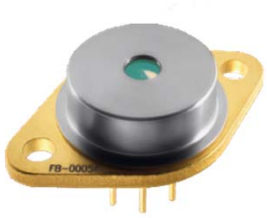
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
935 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	5		45	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			180	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	934	935	937	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.5	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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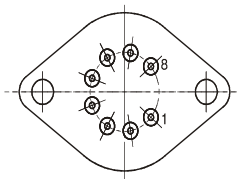
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

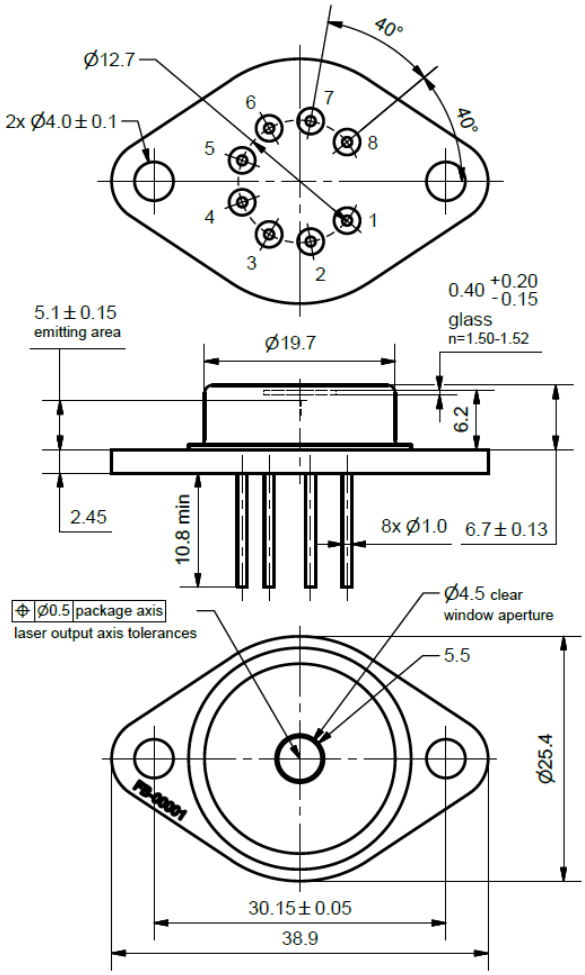
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

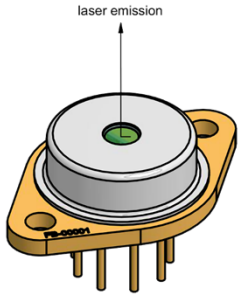


Package Drawings



AIZ-16-311-1543-B

laser emission



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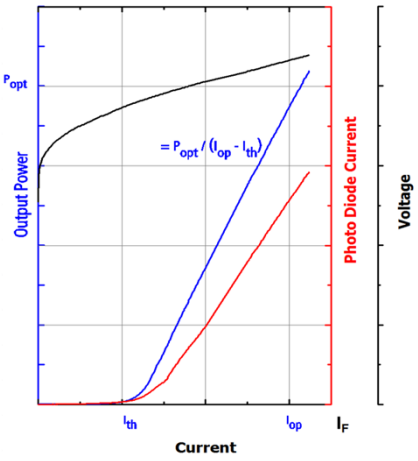
2018-03-02

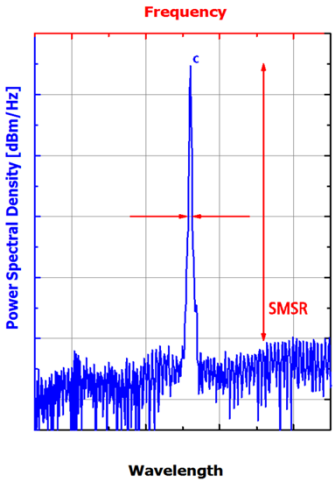
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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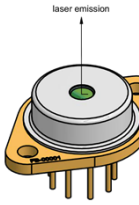

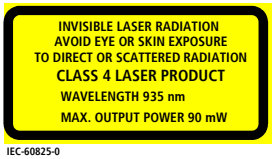

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

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Revision 0.91

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1030 nm DFB Laser	Spectroscopy
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Seed Laser
with PM Fiber and Angled Physical Contact (APC)	

Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	5		50	
Forward Current (cw)	I_F	mA			190	
Forward Current (pulse mode)	I_{Fpeak}	mA			1600	
Reverse Voltage	V_R	V			2	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	10		40	measured by integrated Thermistor
Forward Current (cw)	I_F	mA			180	under cw conditions
Forward Current (pulse mode)	I_{fpeak}	mA			1500	under Pulse Mode Conditions

Pulse Mode Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Pulse Width	t_p	ns		10		longer pulses, higher rep rates or duty cycles may damage the laser - other pulse conditions may be applicable but have not been specifically tested
Pulse Repetition Rate	RR	kHz		200		
Duty Cycle	D.C.	%		0.2		

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics (Pulse Mode Operation) T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1028	1030	1032	tighter specification available on request
Peak Power	P_{peak}	mW		600		
Sidemode Supression Ratio	SMSR	dB	25			
Wavelength Chirp	I_{LD}	mA			200	
Pulse-to-Pulse Stability	ΔP_{peak}	%		3		Integration >1,000 pulses (infinite persistence)

Characteristics (cw Operation) T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm				
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 50 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 50 mW
Laser Current @ Popt = 50 mW	I_{LD}	mA			180	
Slope Efficiency	η	W / A	0.2	0.4	0.7	
Threshold Current	I_{th}	mA			70	

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 50 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 50 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 50 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 50 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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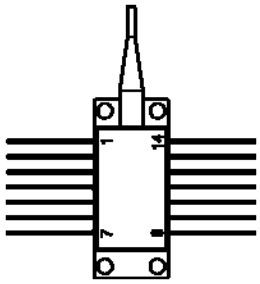
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

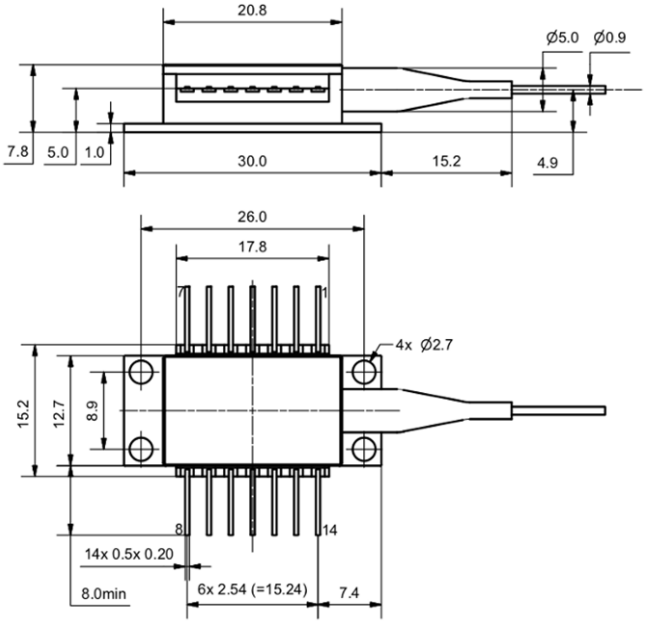
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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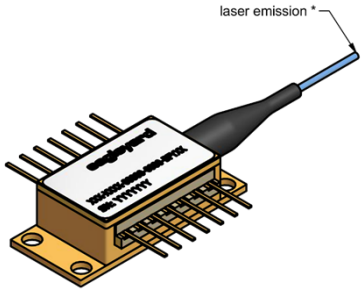
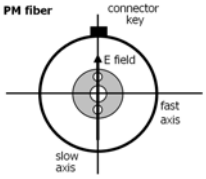


Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	different variants available

Measurement Conditions / Comments



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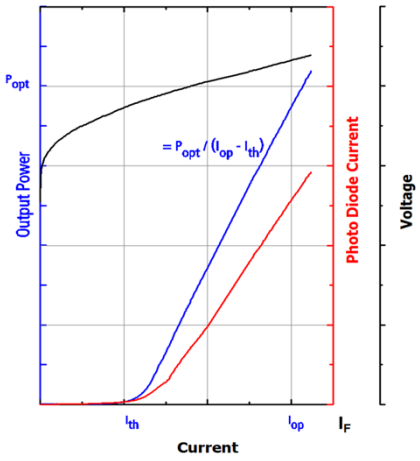
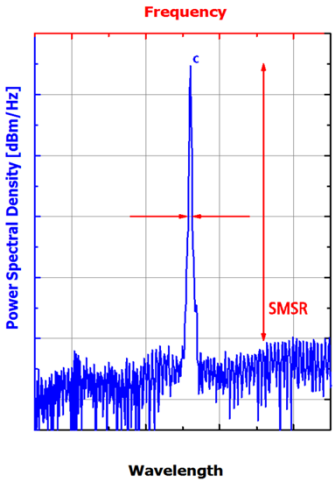
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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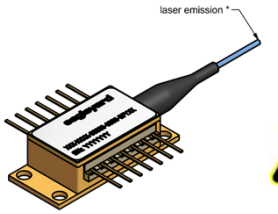


IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

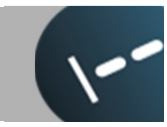
DATA SHEET

EYP-DFB-1060-00040-1500-BFY02-0002

Revision 0.70

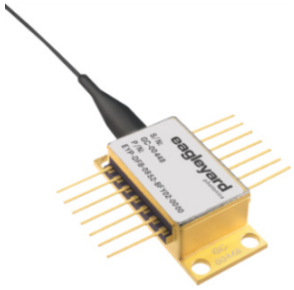
20.11.2015

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser



General Product Information

Product	Application
1060 nm DFB Laser with hermetic Butterfly Housing	Spectroscopy
Monitor Diode, Thermoelectric Cooler and Thermistor	Metrology
PM Fiber with angle-polished Connector	THz Generation
ROHS compliant	



Absolute Maximum Ratings

	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings can cause permanent damage to the device.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			180	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			50	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_C	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured with integrated thermistor
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	10		40	

Characteristics at T_{LD} = 25 °C at Begin Of Life

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1059	1060	1061	The laser allows wavelength tuning by temperature or current variation; in case of external backreflections small mode-hops of 100 MHz or less may appear; the use of a BFW01 or TOC03 package variants and effective optical isolation is recommended for spectroscopic application requiring absolutely mode-hop-free tuning
Tuning Range by Temperature	$\Delta\lambda_T$	nm		1.5		
Spectral Width (FWHM)	$\Delta\nu$	MHz		2		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Output Power @ I_F : 170 mA	P_{opt}	mW	40			

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{amb} 25 °C at Begin Of Life cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Slope Efficiency	η	W / A	0.2	0.4	0.7	
Threshold Current	I_{th}	mA			70	
Sidemode Supression Ratio	SMSR	dB	30	50		P_{opt} = 10 mW … 40 mW ; T_{LD} = 15 °C … 40 °C
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 40 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon}/P_{opt}	µA/mW	1		20	Reverse Voltage $U_{R\ MD}$ = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 40 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 40 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.4		P_{opt} = 40 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 40 mW, $\Delta T = I\ T_{case} - T_{LD}\ I$

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T = 0° … 50° C
Steinhart & Hart Coefficient	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient	C			8.7755×10^{-8}		R: resistance at T im Ohm

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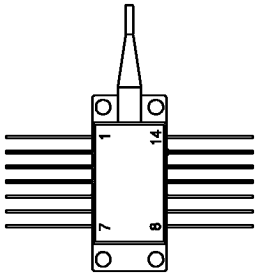
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Fiber and Connector Type

		Measurement Conditions / Comments
PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)	
Connector	FC/APC (narrow key / 2mm)	other connectors on request

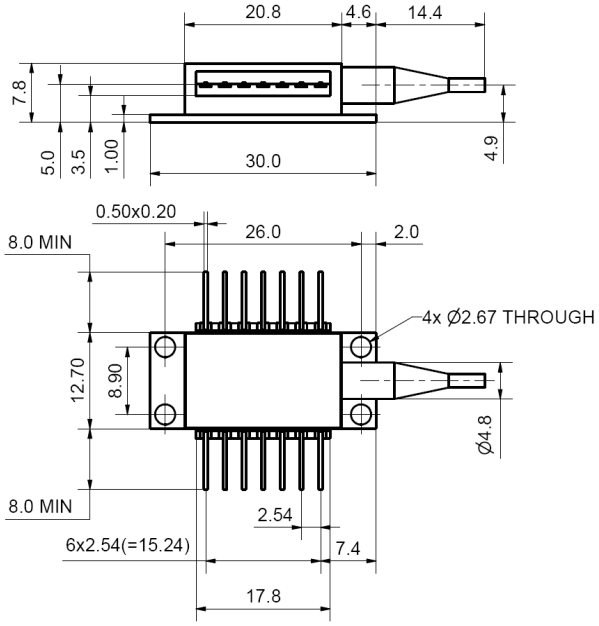
Package Pinout

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected



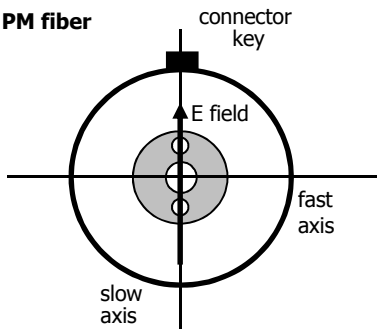
top view

Package Drawings



recommended
min. bending radius: 30 mm

Z11-SPEC-BFY02-DFB-0000



slow axis of the PM fiber aligned to connector key

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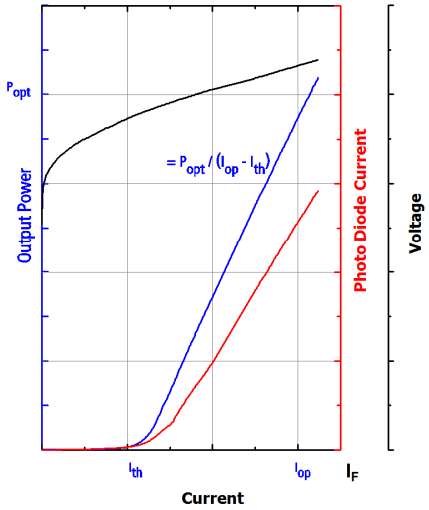
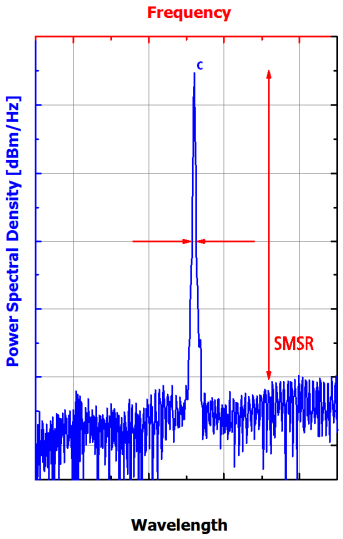
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.

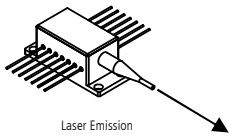
Unpacking, Installation and Laser Safety

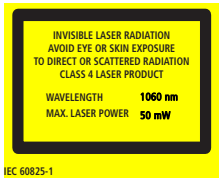
Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

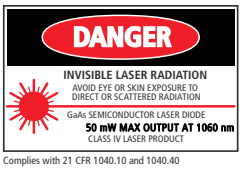
The DFB diode type is known to be sensitive against optical feedback, so an optical isolator may be required in some cases. Operating at moderate temperatures on a proper metal heat sinks willl contribute to stable operation and a long lifetime of the diode.

The laser emission from this diode is close to the invisible infrared region of the electromagnetic spectrum. Avoid direct and/or indirect exposure to the free running beam. Collimating the free running beam with optics as common in optical instruments will increase threat to the human eye.

Each laser diode will come with an individual test protocol verifying the parameters given in this document.







Complies with 21 CFR 1040.10 and 1040.40

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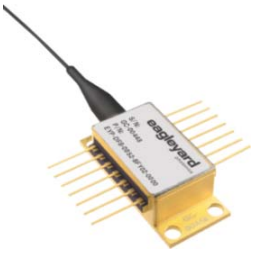
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1064 nm DFB Laser	Spectroscopy
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Nd:YAG Replacement
with PM Fiber, integrated µ-Isolator and Angled Physical Contact (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-15		70	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			190	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			30	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	5		60	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	8		25	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1063	1064	1065	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 25 mW
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 25 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	
Mode-hop free Power Range	P_{opt}	mW	10		25	
Laser Current @ P_{opt} = 25 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A		0.3		
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 25 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	2		50	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 25 mW, ΔT =30 K
Voltage	U_{TEC}	V		1.5		P_{opt} = 25 mW, ΔT = 30 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 25 mW, ΔT = 30 K
Temperature Difference	ΔT	K			45	P_{opt} = 25 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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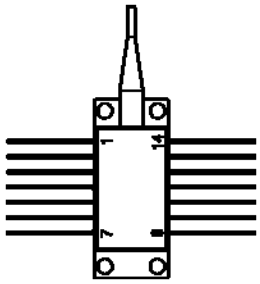
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

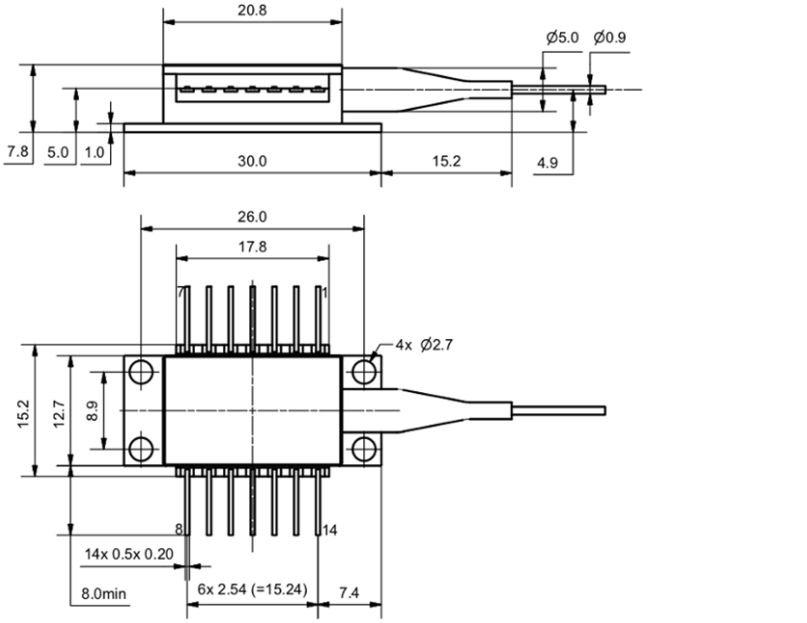
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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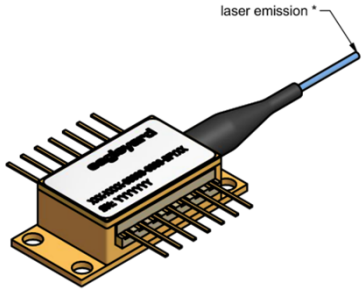


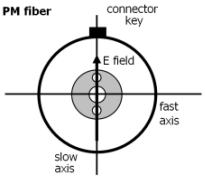
Caution. Excessive mechanical stress on the package can lead to a damage of the laser.

See instruction manual on www.eagleyard.com

Fiber and Connector Type

PM Fiber	900 / 125 / 6.6 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	FC/APC (narrow key / 2mm)

Measurement Conditions / Comments



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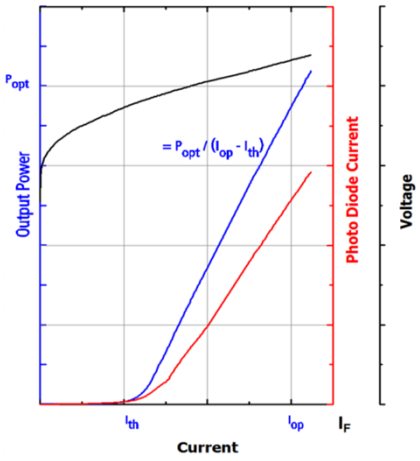
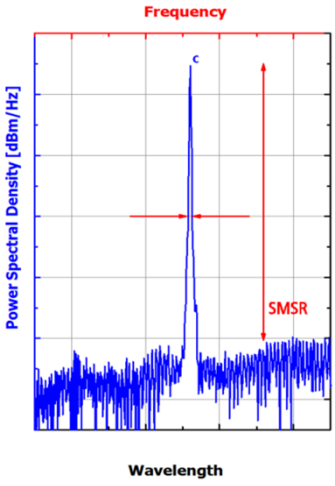
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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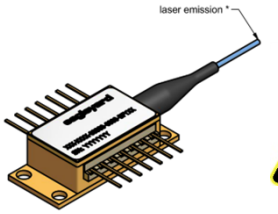
Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.



IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

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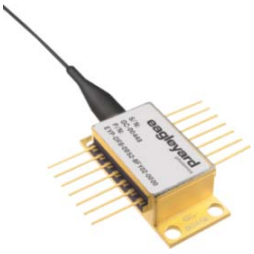
Revision 1.04

2019-02-26

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1064 nm DFB Laser	Spectroscopy
with hermetic 14 Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Nd:YAG Replacement
with PM Fiber and Angled Physical Contact (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			190	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			45	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C		25		
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	10		40	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1063	1064	1065	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 40 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 40 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 40 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A	0.2	0.4	0.7	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 40 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		30	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 40 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 40 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 40 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 40 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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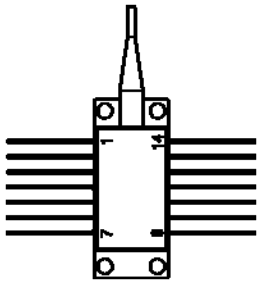
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

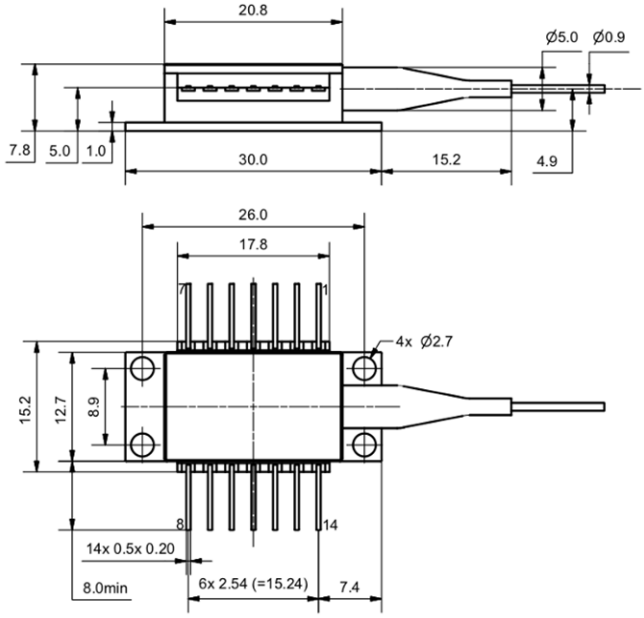
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

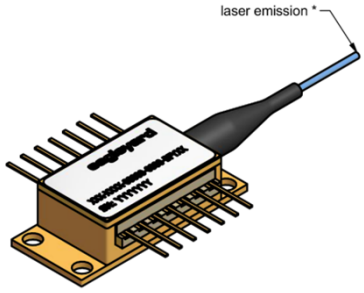
Pins are isolated from case unless noted otherwise.



Package Drawings



AIZ-16-0222-1415



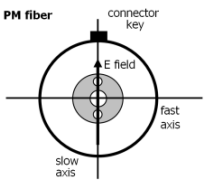
Caution. Excessive mechanical stress on the package can lead to a damage of the laser.

See instruction manual on www.eagleyard.com

Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	FC/APC (narrow key / 2mm)

Measurement Conditions / Comments



EYP-DFB-1064-00040-1500-BFY02-0000

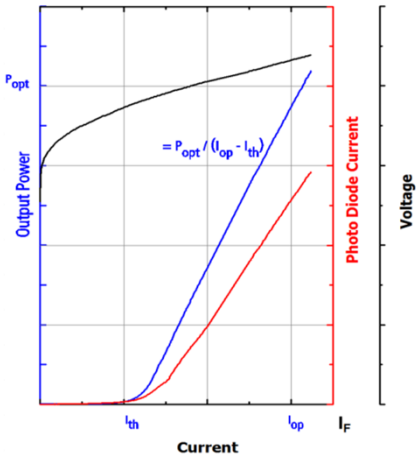
Revision 1.04

2019-02-26

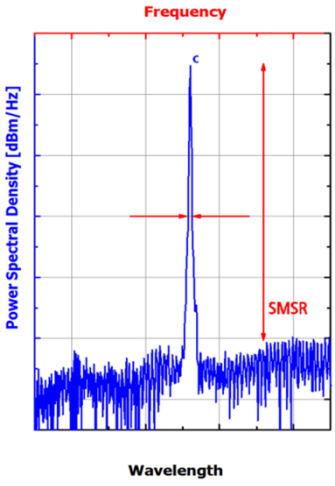
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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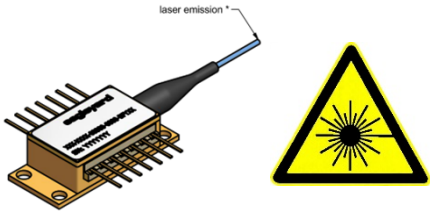


IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-1064-00040-1500-BFY02-0002

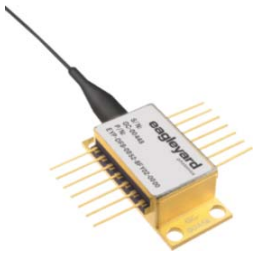
Revision 1.04

2019-02-26

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1064 nm DFB Laser	Spectroscopy
with hermetic 14 Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Nd:YAG Replacement
with PM Fiber and Angled Physical Contact (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			190	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			45	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	10		40	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1063	1064	1065	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 40 mW
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		see note 1)
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 40 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	
Mode-hop free Power Range	P_{opt}	mW	10		40	
Laser Current @ P_{opt} = 40 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A	0.2	0.4	0.7	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 40 mW

1) This variant allows wavelength tuning by temperature or current variation; in case of external backreflections small mode-hops of 100 MHz or less may appear; the use of a BFW01 or TOC03 package variants and effective optical isolation is recommended for spectroscopic application requiring absolutely mode-hop-free tuning.

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		30	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 40 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 40 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 40 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 40 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

DATA SHEET

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Revision 1.04

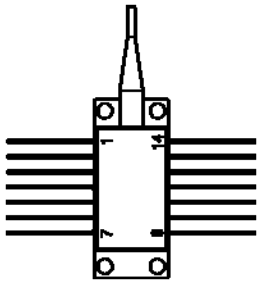
2019-02-26

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

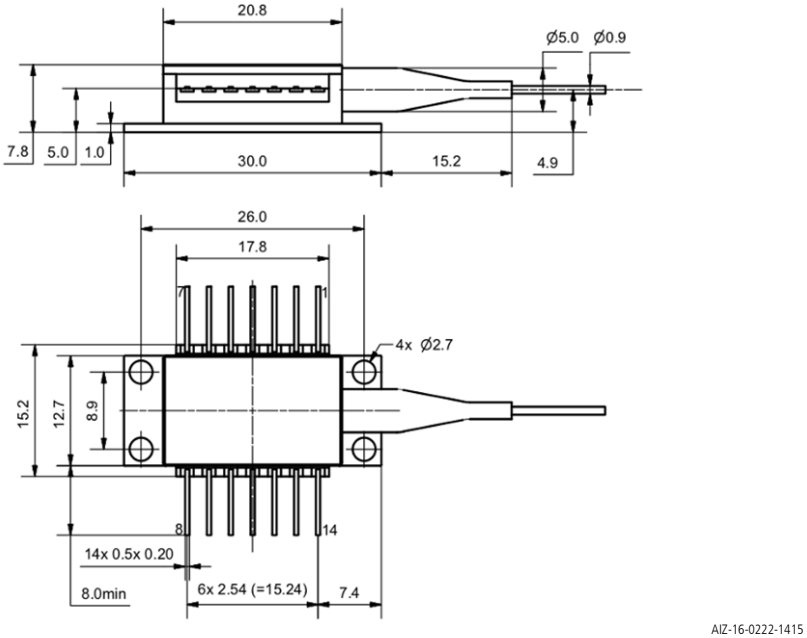
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

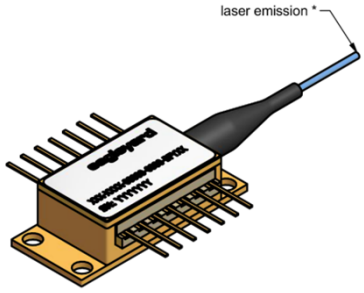
Pins are isolated from case unless noted otherwise.



Package Drawings



AIZ-16-0222-1415



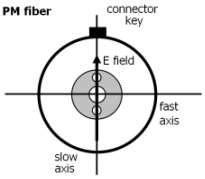
Caution. Excessive mechanical stress on the package can lead to a damage of the laser.

See instruction manual on www.eagleyard.com

Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	FC/APC (narrow key / 2mm)

Measurement Conditions / Comments



DATA SHEET

EYP-DFB-1064-00040-1500-BFY02-0002

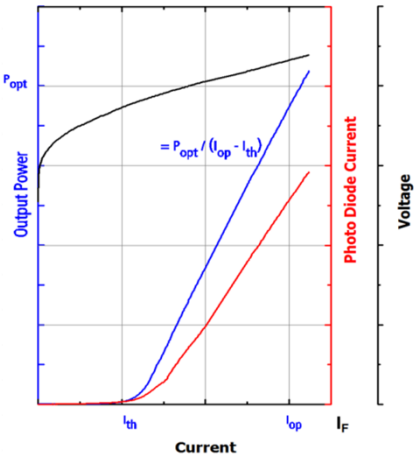
Revision 1.04

2019-02-26

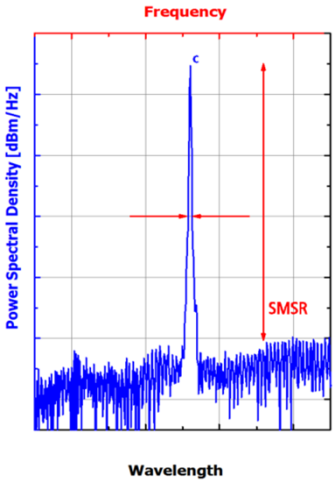
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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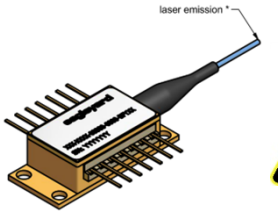


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1064 nm
MAX. OUTPUT POWER 45 mW

IEC-60825-0

DANGER

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
mW MAX OUTPUT AT 1064 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-1064-00080-1500-TOC03-0000

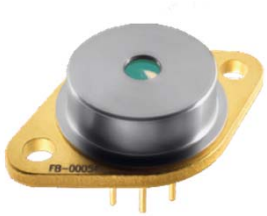
Revision 0.93

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1064 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Nd:YAG Replacement



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			190	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1063	1064	1065	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

EYP-DFB-1064-00080-1500-TOC03-0000

Revision 0.93

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A	0.6	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.5		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

EYP-DFB-1064-00080-1500-TOC03-0000

Revision 0.93

2018-03-02

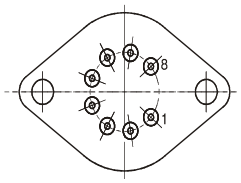
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

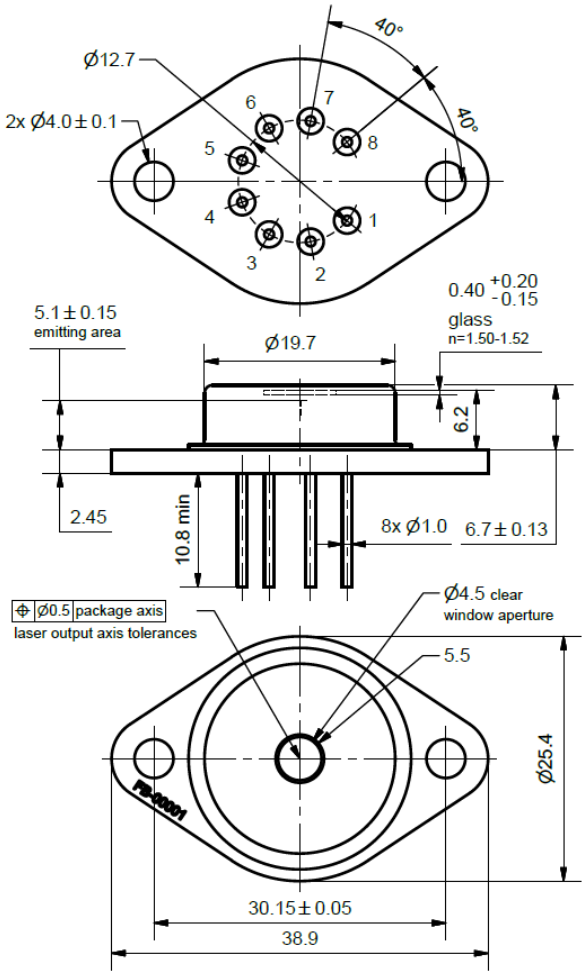
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

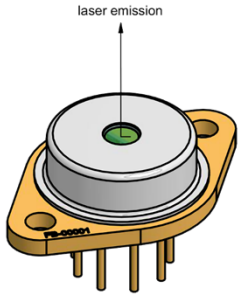


Package Drawings



AIZ-16-311-1543-B

laser emission



DATA SHEET

EYP-DFB-1064-00080-1500-TOC03-0000

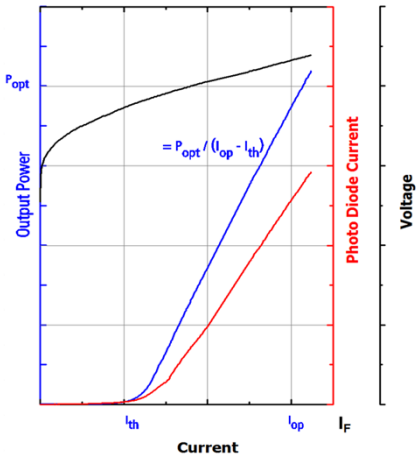
Revision 0.93

2018-03-02

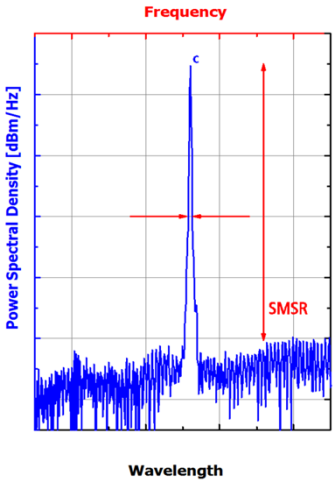
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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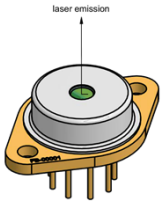


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1064 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-1064-00080-1500-TOC03-0002

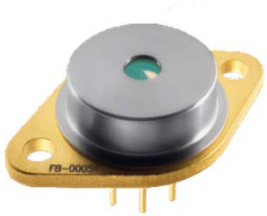
Revision 0.93

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1064 nm DFB Laser	Spectroscopy
with hermetic 8-Pin TO Package (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Nd:YAG Replacement



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			190	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			170	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1063	1064	1065	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		80 mW
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	
Mode-hop free Power Range	P_{opt}	mW	20		80	
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A	0.6	0.8	1.1	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.5		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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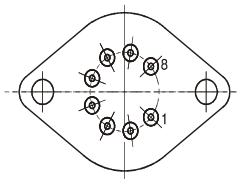
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

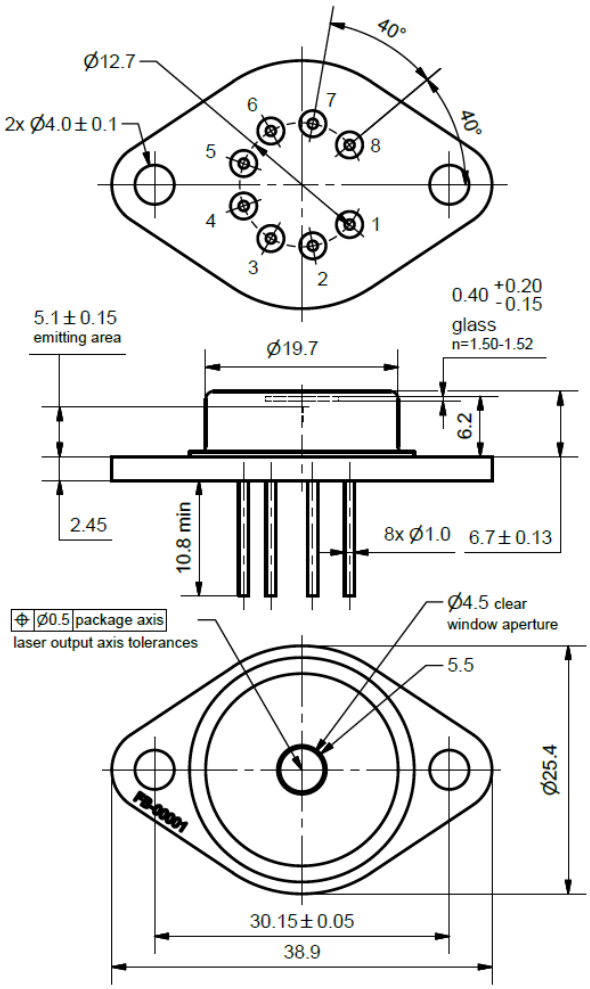
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

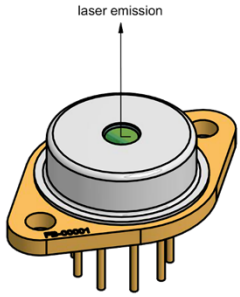


Package Drawings



AIZ-16-311-1543-B

laser emission



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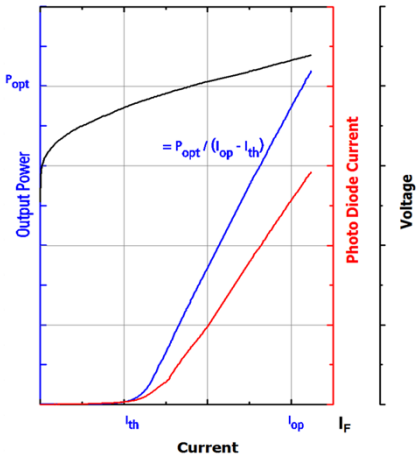
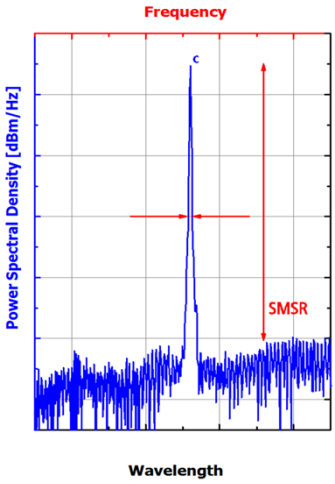
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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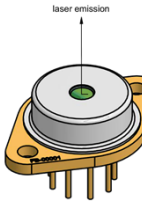
Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.



INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1064 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

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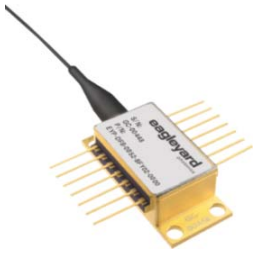
2019-02-26

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1064 nm DFB Laser	Spectroscopy
with hermetic 14 Pin Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Seed Laser
with PM Fiber and Angled Physical Contact (APC)	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	5		50	
Forward Current (cw)	I_F	mA			190	
Forward Current (pulse mode)	I_{Fpeak}	mA			1600	
Reverse Voltage	V_R	V			2	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	10		40	measured by integrated Thermistor
Forward Current (cw)	I_F	mA			170	under cw conditions
Forward Current (pulse mode)	I_{fpeak}	mA			1500	under Pulse Mode Conditions

Pulse Mode Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Pulse Width	t_p	ns		10		longer pulses, higher rep rates or duty cycles may damage the laser - other pulse conditions may be applicable but have not been specifically tested
Pulse Repetition Rate	RR	kHz		200		
Duty Cycle	D.C.	%		0.2		

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics (Pulse Mode Operation) T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1062	1064	1066	tighter specification available on request
Peak Power	P_{peak}	mW		600		
Sidemode Supression Ratio	SMSR	dB	25			
Wavelength Chirp	I_{LD}	mA			200	
Pulse-to-Pulse Stability	ΔP_{peak}	%		3		Integration >1,000 pulses (infinite persistence)

Characteristics (cw Operation) T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm				
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} = 40 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 40 mW
Laser Current @ Popt = 40 mW	I_{LD}	mA			170	
Slope Efficiency	η	W / A	0.2	0.4	0.7	
Threshold Current	I_{th}	mA			70	

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		30	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 40 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 40 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 40 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 40 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

DATA SHEET

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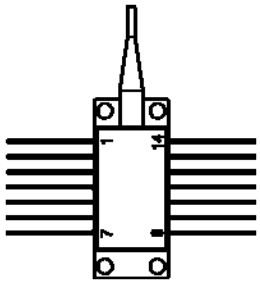
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

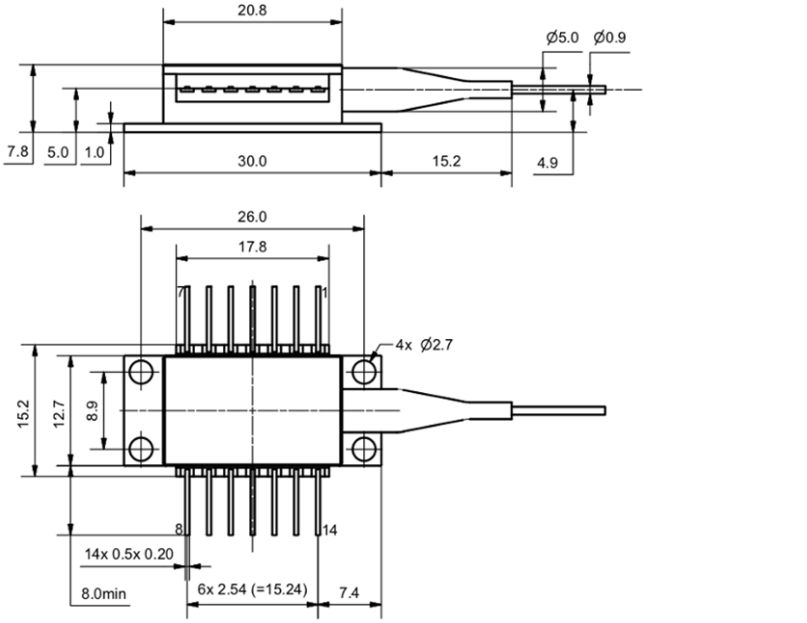
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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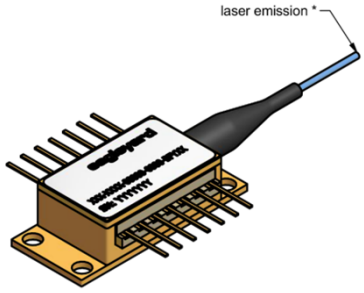


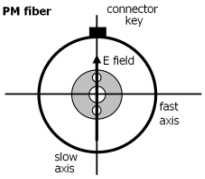
Caution. Excessive mechanical stress on the package can lead to a damage of the laser.

See instruction manual on www.eagleyard.com

Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	FC/APC (narrow key / 2mm)

Measurement Conditions / Comments



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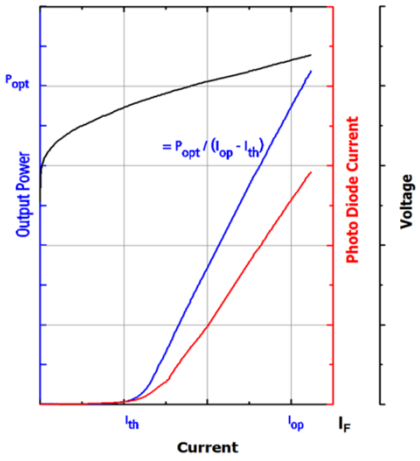
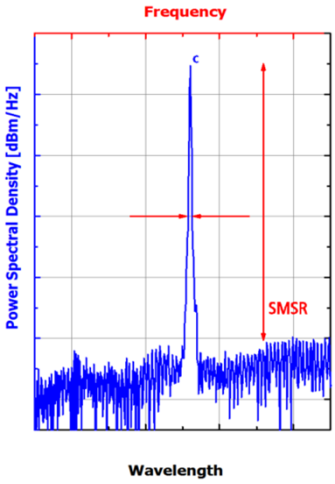
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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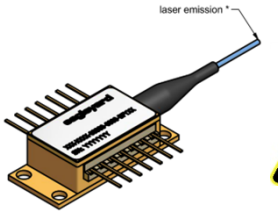
Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.



INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1064 nm
MAX. OUTPUT POWER 50 mW

IEC-60825-0

DANGER

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
mW MAX OUTPUT AT 1064 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

EYP-DFB-1083-00025-1500-BFY12-0002

Revision 0.70

2017-09-14

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1083 nm DFB Laser	He Polarizaton
with hermetic 14-Pin Butterfly Housing (RoHS compliant)	Spectroscopy
including Monitor Diode, Thermoelectric Cooler and Thermistor	Metrology
with PM Fiber, integrated µ-Isolator and Angled Physical Contact (APC)	

Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-15		70	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			30	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	5		60	
Operational Temperature at Laser Chip	T_{LD}	°C	10		45	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	8		25	ex fiber

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		see note 1)
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		see note 1)
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 25 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	10		30	
Laser Current @ P_{opt} = 25 mW	I_{LD}	mA			150	ex fiber
Slope Efficiency	η	W / A		0.3		
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 25 mW

1) This variant allows wavelength tuning by temperature or current variation; in case of external backreflections small mode-hops of 100 MHz or less may appear; the use of a BFW01 or TOC03 package variants and effective optical isolation is recommended for spectroscopic application requiring absolutely mode-hop-free tuning.

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 25 mW, ΔT =30 K
Voltage	U_{TEC}	V		1.5		P_{opt} = 25 mW, ΔT = 30 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 25 mW, ΔT = 30 K
Temperature Difference	ΔT	K			45	P_{opt} = 25 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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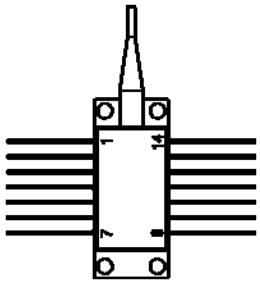
2017-09-14

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

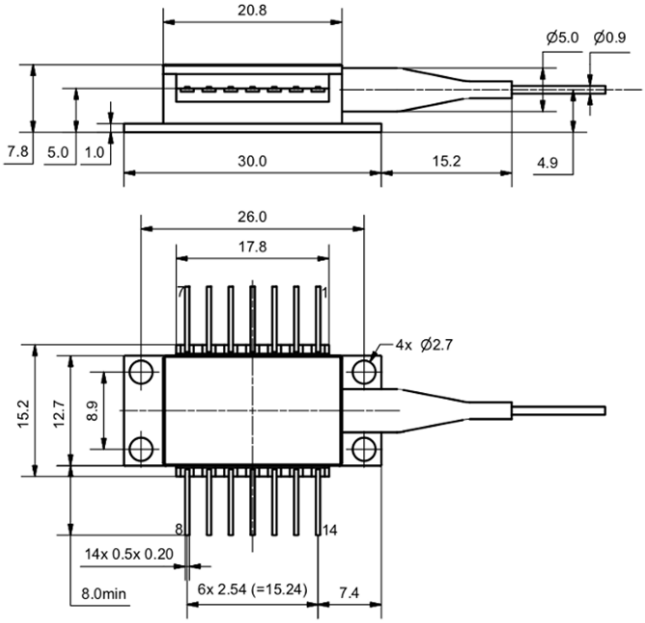
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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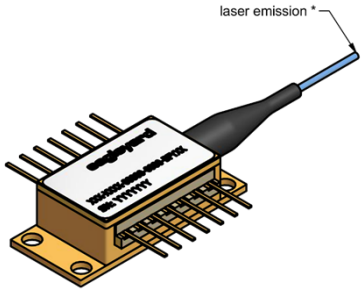
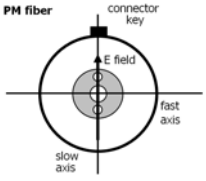


Fiber and Connector Type

PM Fiber	900 / 125 / 6.6 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	different variants available

Measurement Conditions / Comments



EYP-DFB-1083-00025-1500-BFY12-0002

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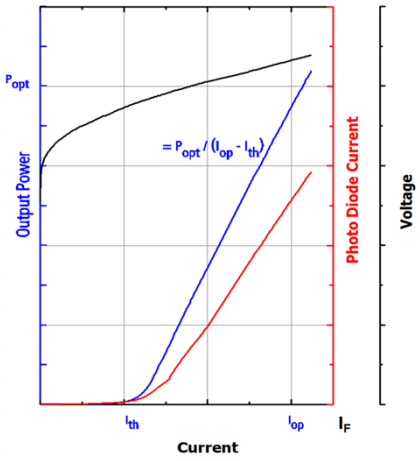
2017-09-14

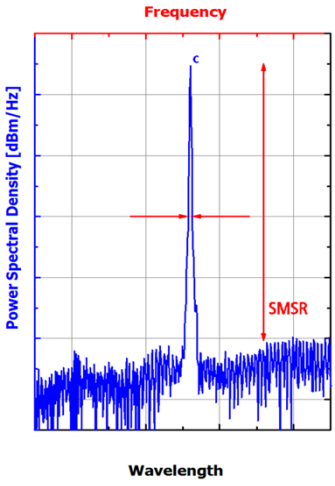
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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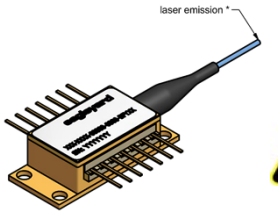

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1083 nm
MAX. OUTPUT POWER 30 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
30 mW MAX OUTPUT AT 1083 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

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Revision 0.93

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1083 nm DFB Laser with hermetic 14 Pin Butterfly Housing	Spectroscopy
including Monitor Diode, Thermoelectric Cooler and Thermistor	Metrology
with PM Fiber and Angled Physical Contact (APC)	
High-reliable Package compliant for Space Applications	

Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			35	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	10		30	ex fiber

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 30 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 30 mW	I_{LD}	mA			150	
Slope Efficiency	η	W / A	0.1	0.3	0.6	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 30 mW

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 30 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 30 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 30 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 30 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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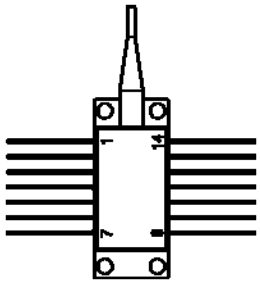
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

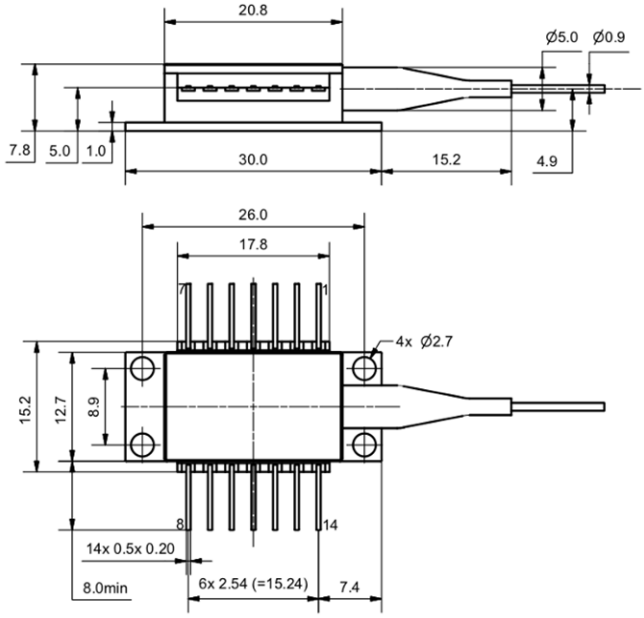
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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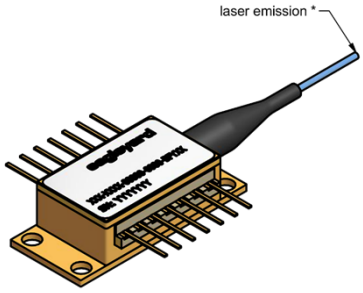
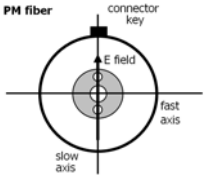


Fiber and Connector Type

SM Fiber	
Connector	different variants available

Measurement Conditions / Comments



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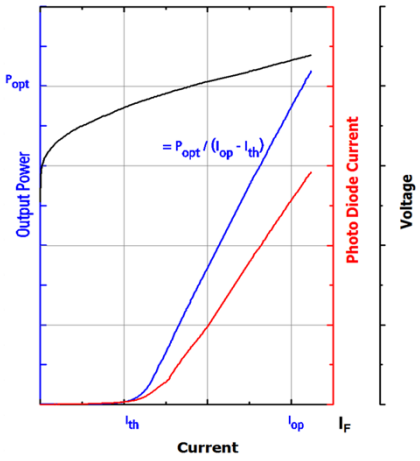
2017-03-02

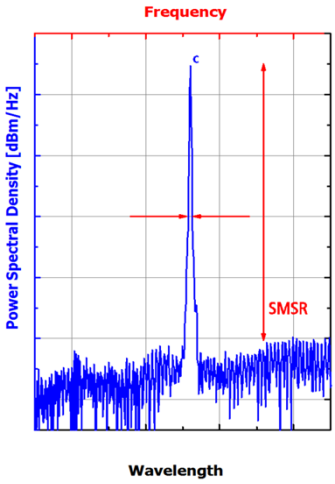
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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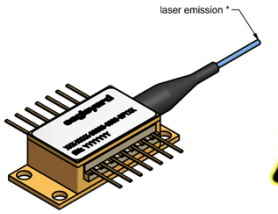

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1083 nm
MAX. OUTPUT POWER 35 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
35 mW MAX OUTPUT AT 1083 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-1083-00030-1500-BFY02-0002

Revision 0.93

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1083 nm DFB Laser with hermetic 14 Pin Butterfly Housing	He Polarizaton
including Monitor Diode, Thermoelectric Cooler and Thermistor	Spectroscopy
with PM Fiber and Angled Physical Contact (APC)	Metrology
High-reliable Package compliant for Space Applications	

Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			160	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			35	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			150	
Output Power	P_{opt}	mW	10		30	ex fiber

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		see note 1)
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		see note 1)
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 30 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	10		30	
Laser Current @ P_{opt} = 30 mW	I_{LD}	mA			150	
Slope Efficiency	η	W / A	0.1	0.3	0.6	
Threshold Current	I_{th}	mA			70	
Polarization Extinction Ratio	PER	dB		20		P_{opt} = 30 mW

1) This variant allows wavelength tuning by temperature or current variation; in case of external backreflections small mode-hops of 100 MHz or less may appear; the use of a BFW01 or TOC03 package variants and effective optical isolation is recommended for spectroscopic application requiring absolutely mode-hop-free tuning.

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	1		20	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 30 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 30 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 30 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 30 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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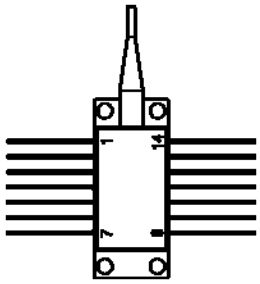
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

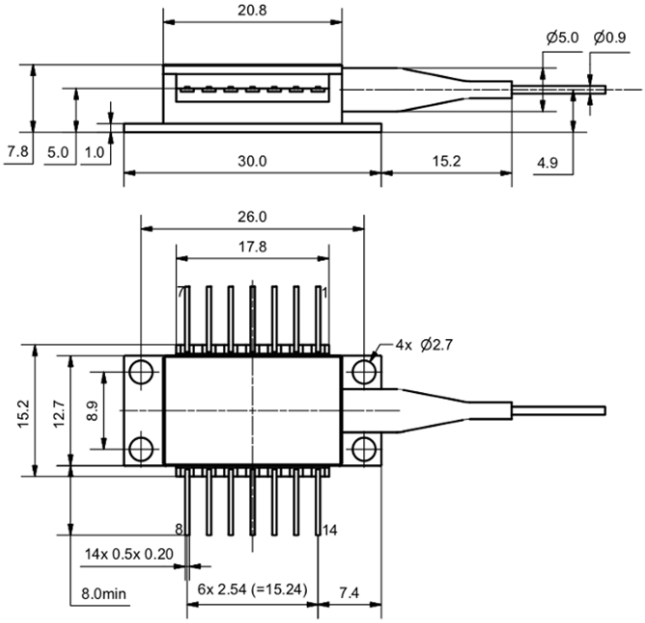
Pin Assignment

1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

Pins are isolated from case unless noted otherwise.



Package Drawings



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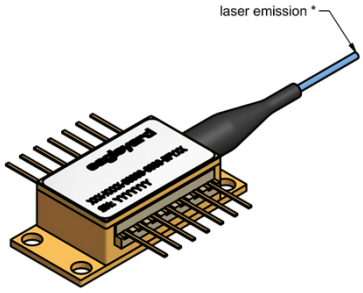
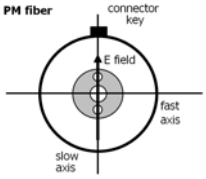


Fiber and Connector Type

PM Fiber	900 / 125 / 5.5 µm, UV/Polyester-elastomer Coating (l = 1 +/-0.1 m)
Connector	different variants available

Measurement Conditions / Comments



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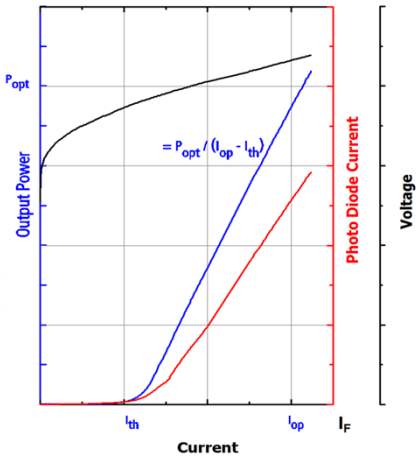
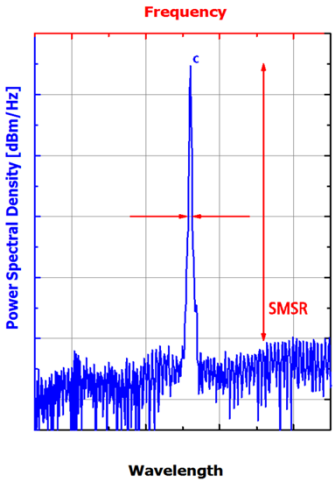
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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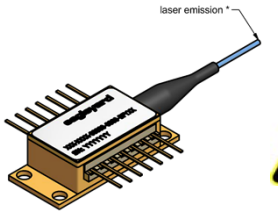


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1083 nm
MAX. OUTPUT POWER 35 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
35 mW MAX OUTPUT AT 1083 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-1083-00080-1500-BFW01-0000

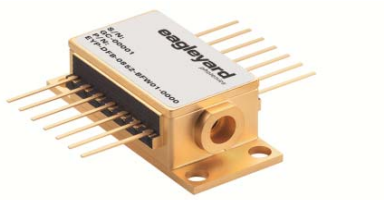
Revision 0.52

2017-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1083 nm DFB Laser	Spectroscopy
with hermetic 14 Pin-Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Magnetometer
with integrated Beam Collimation	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.1	
TEC Voltage	V_{TEC}	V			2.8	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			190	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			190	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		0.1		parallel to the base plate of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		0.1		perpendicular to base plate of the housing (see p. 3)
Beam Diameter horizontal ($1/e^2$)	$d_{\parallel}$	mm		1.0	1.2	parallel to the base plate of the housing (see p. 3)
Beam Diameter vertical ($1/e^2$)	$d_{\perp}$	mm		0.8	1.2	perpendicular to base plate of the housing (see p. 3)
Degree of Polarization	DOP	%		90		P_{opt} = 80 mW; E field parallel to the base plate

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.5		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.4		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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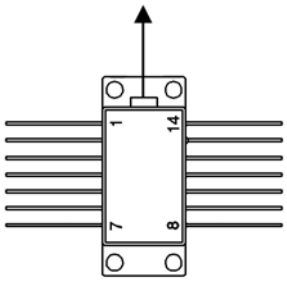
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

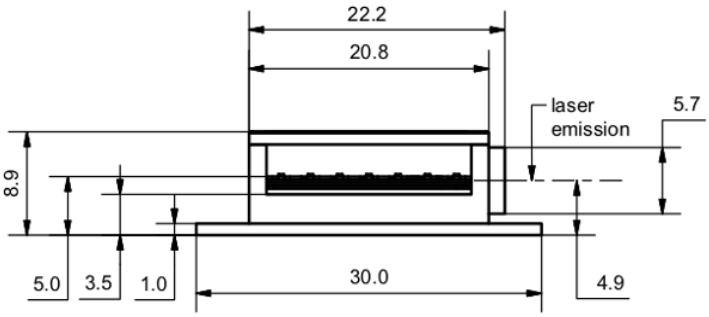
1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

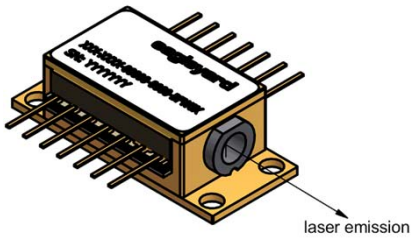
Pins are isolated from case unless noted otherwise.

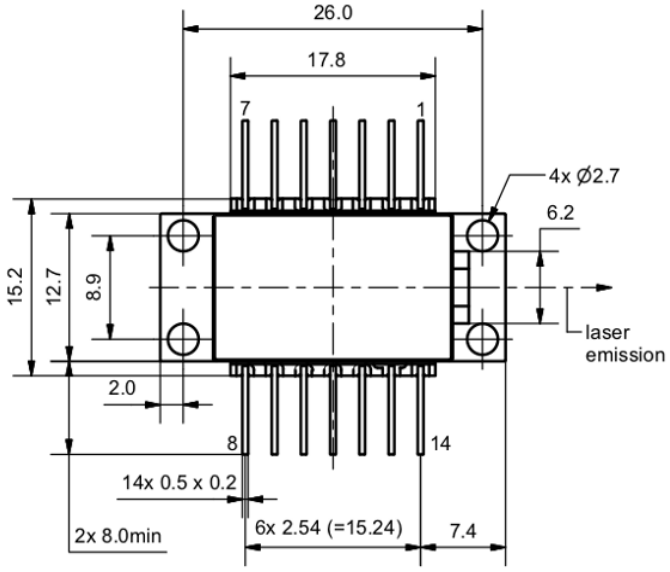
top view



Package Drawings







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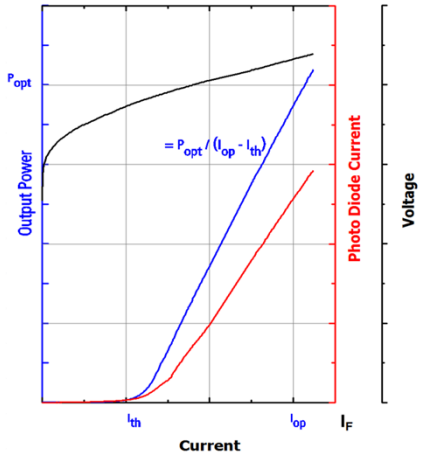
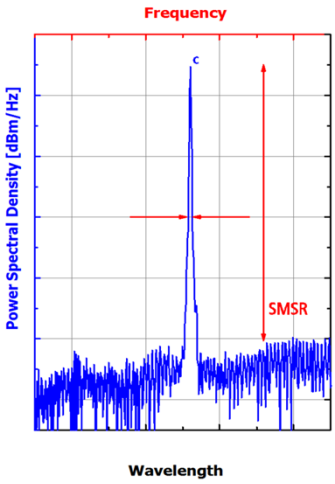
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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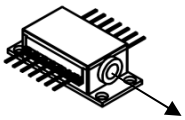
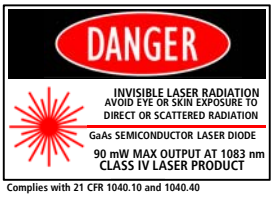


Laser Emission

IEC-60825-0



Complies with 21 CFR 1040.10 and 1040.40

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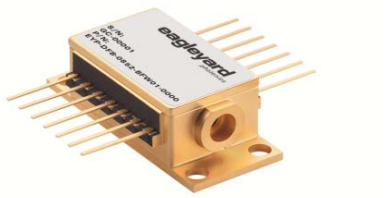
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1083 nm DFB Laser	Spectroscopy
with hermetic 14 Pin-Butterfly Housing (RoHS compliant)	Metrology
including Monitor Diode, Thermoelectric Cooler and Thermistor	Magnetometer
with integrated Beam Collimation	



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-40		85	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.1	
TEC Voltage	V_{TEC}	V			2.8	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			190	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	20		80	
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			190	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		0.1		parallel to the base plate of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		0.1		perpendicular to base plate of the housing (see p. 3)
Beam Diameter horizontal (1/e²)	$d_{\parallel}$	mm		1.0	1.2	parallel to the base plate of the housing (see p. 3)
Beam Diameter vertical (1/e²)	$d_{\perp}$	mm		0.8	1.2	perpendicular to base plate of the housing (see p. 3)
Degree of Polarization	DOP	%		90		P_{opt} = 80 mW; E field parallel to the base plate

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.05		10	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.4		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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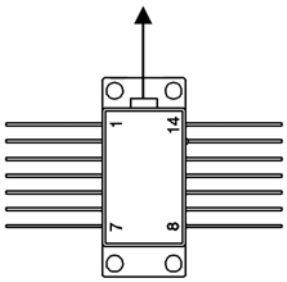
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

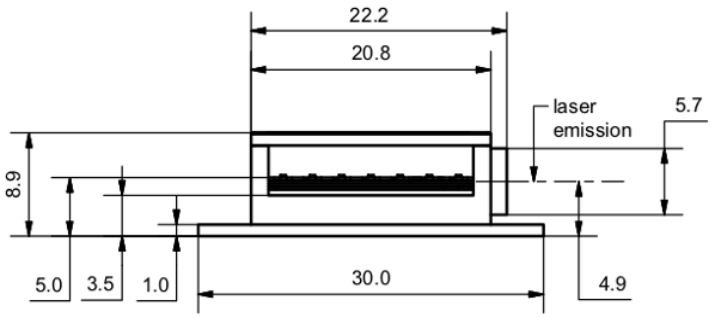
1	Thermoelectric Cooler (+)	14	Thermoelectric Cooler (-)
2	Thermistor	13	Case
3	Photodiode (Anode)	12	not connected
4	Photodiode (Cathode)	11	Laser Diode (Cathode)
5	Thermistor	10	Laser Diode (Anode)
6	not connected	9	not connected
7	not connected	8	not connected

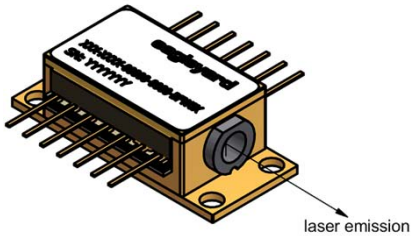
Pins are isolated from case unless noted otherwise.

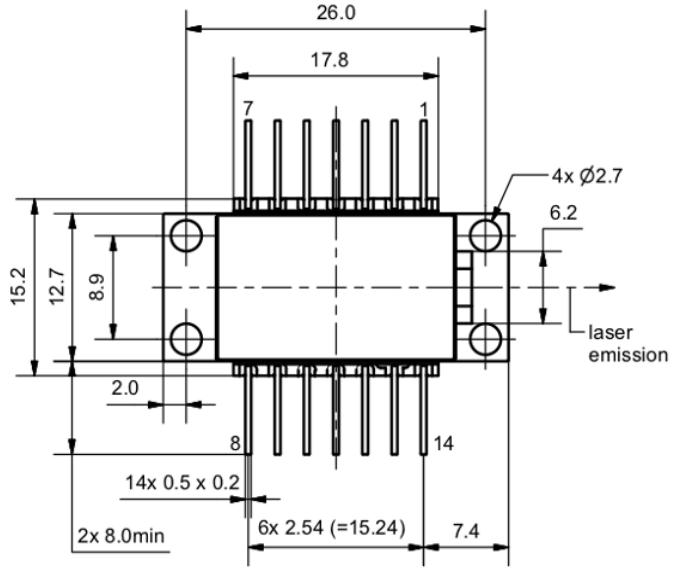
top view



Package Drawings







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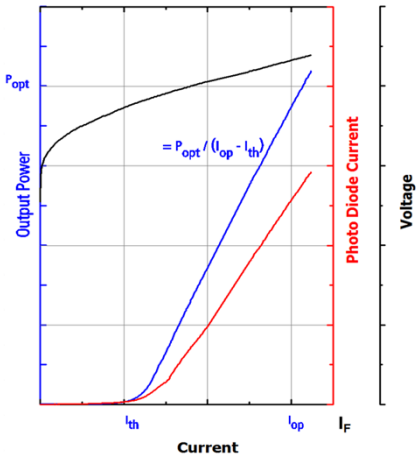
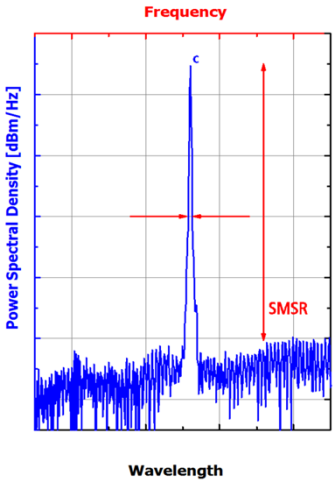
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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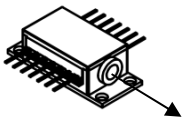

Laser Emission

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40

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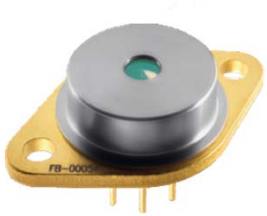
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
1083 nm DFB Laser	Spectroscopy
with hermetic 8 Pin TO Package	He Polarization
including Monitor Diode, Thermoelectric Cooler and Thermistor	Metrology



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			190	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		P_{opt} =
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			190	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.05		1	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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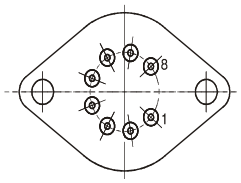
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Pin Assignment

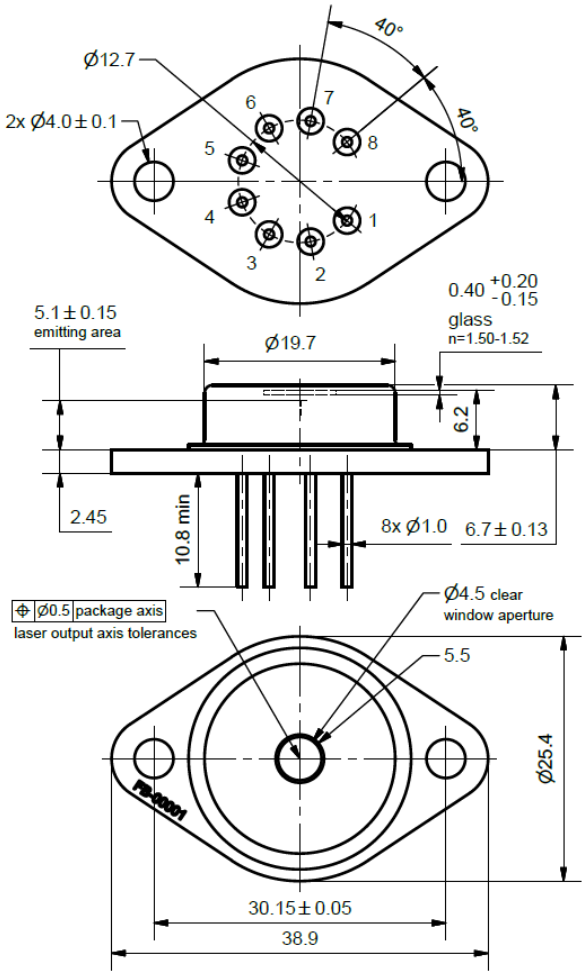
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view

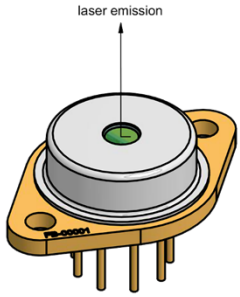


Package Drawings



AIZ-16-311-1543-B

laser emission



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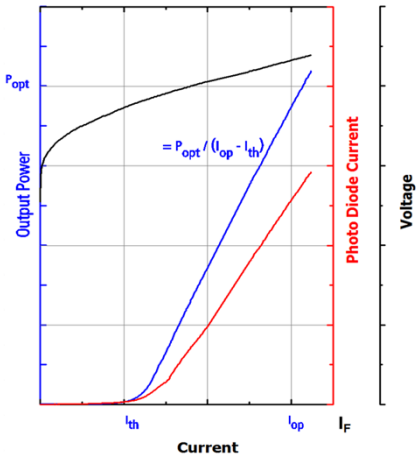
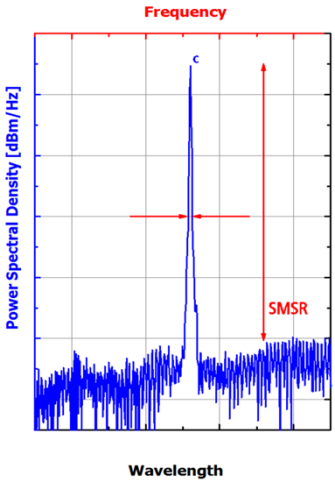
SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



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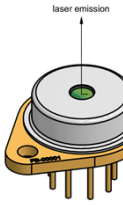


INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1083 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
GaAs SEMICONDUCTOR LASER DIODE
90 mW MAX OUTPUT AT 1083 nm
CLASS IV LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.40

DATA SHEET

EYP-DFB-1083-00080-1500-TOC03-0002

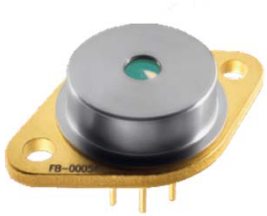
Revision 0.97

2018-03-02

SINGLE FREQUENCY LASER DIODES
Distributed Feedback Laser

General Product Information

Product	Application
Tunable 1083 nm DFB Laser	Spectroscopy
with hermetic 8 Pin TO Package	He Polarization
including Monitor Diode, Thermoelectric Cooler and Thermistor	Metrology



Absolute Maximum Ratings

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Storage Temperature	T_S	°C	-40		85	Stress in excess of one of the Absolute Maximum Ratings may damage the laser. Please note that a damaging optical power level may occur although the maximum current is not reached. These are stress ratings only, and functional operation at these or any other conditions beyond those indicated under Recommended Operational Conditions is not implied.
Operational Temperature at Case	T_C	°C	-20		75	
Operational Temperature at Laser Chip	T_{LD}	°C	10		50	
Forward Current	I_F	mA			200	
Reverse Voltage	V_R	V			2	
Output Power	P_{opt}	mW			90	
TEC Current	I_{TEC}	A			1.8	
TEC Voltage	V_{TEC}	V			3.2	

Recommended Operational Conditions

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Operational Temperature at Case	T_{case}	°C	-20		65	
Operational Temperature at Laser Chip	T_{LD}	°C	15		40	measured by integrated Thermistor
Forward Current	I_F	mA			190	
Output Power	P_{opt}	mW	20		80	

Characteristics at T_{LD} = 25° at BOL

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Center Wavelength	λ_C	nm	1082	1083	1084	see images on page 4
Linewidth (FWHM)	$\Delta\lambda$	MHz		2		
Mode-hop free Tuning Range	$\Delta\lambda_{tune}$	pm		1500		reached by temperature modulation
Temperature Coefficient of Wavelength	$d\lambda / dT$	nm / K		0.06		
Current Coefficient of Wavelength	$d\lambda / dI$	nm / mA		0.003		
Sidemode Supression Ratio	SMSR	dB	30	45		P_{opt} = 80 mW

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Characteristics at T_{LD} = 25° at BOL cont'd

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Mode-hop free Temperature Range	T_{LD}	° C	15		40	temperature measured by integrated themistor
Mode-hop free Power Range	P_{opt}	mW	20		80	
Laser Current @ P_{opt} = 80 mW	I_{LD}	mA			190	
Slope Efficiency	η	W / A	0.6	0.8	1.0	
Threshold Current	I_{th}	mA			70	
Divergence parallel (FWHM)	$\Theta_{\parallel}$	°		8		parallel to short axis of the housing (see p. 3)
Divergence perpendicular (FWHM)	$\Theta_{\perp}$	°		21		parallel to long axis of the housing (see p. 3)
Degree of Polarization	DOP	%		90		80 mW; E field parallel to long axis of housing

Monitor Diode

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Monitor Detector Responsivity	I_{mon} / P_{opt}	µA/mW	0.05		1	U_R = 5 V

Thermoelectric Cooler

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Current	I_{TEC}	A		0.4		P_{opt} = 80 mW, ΔT = 20 K
Voltage	U_{TEC}	V		0.8		P_{opt} = 80 mW, ΔT = 20 K
Power Dissipation (total loss at case)	P_{loss}	W		0.5		P_{opt} = 80 mW, ΔT = 20 K
Temperature Difference	ΔT	K			50	P_{opt} = 80 mW, ΔT = |Tcase - TLD|

Thermistor (Standard NTC Type)

Parameter	Symbol	Unit	min	typ	max	Measurement Conditions / Comments
Resistance	R	kΩ		10		T_{LD} = 25° C
Beta Coefficient	β			3892		$R_1 / R_2 = e^{\beta (1/T_1 - 1/T_2)}$ at T_{LD} = 0° … 50° C
Steinhart & Hart Coefficient A	A			1.1293×10^{-3}		$1/T = A + B(\ln R) + C(\ln R)^3$
Steinhart & Hart Coefficient B	B			2.3410×10^{-4}		T: temperature in Kelvin
Steinhart & Hart Coefficient C	C			8.7755×10^{-8}		R: resistance at T in Ohm

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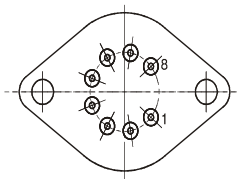
Pin Assignment

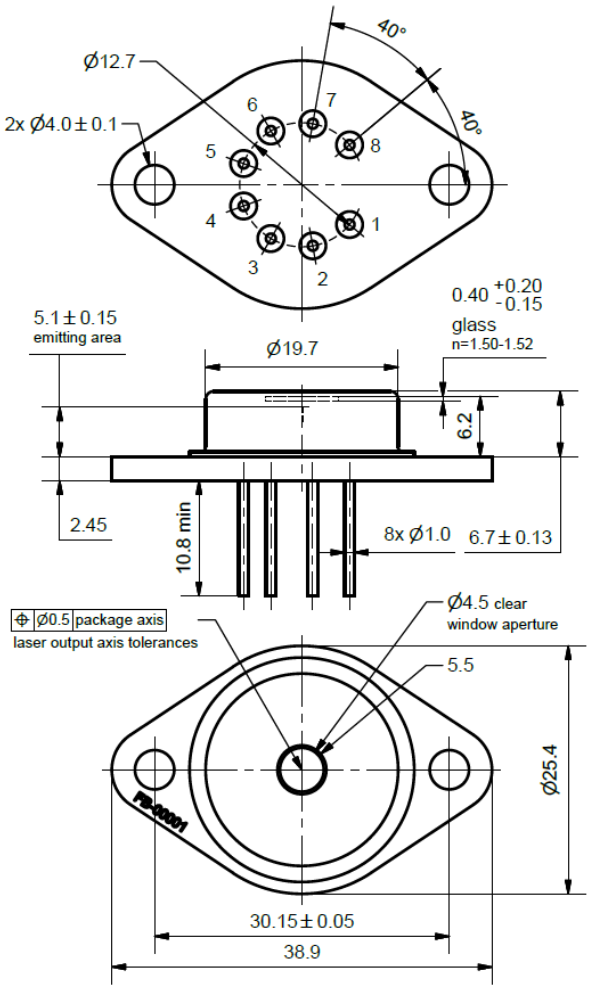
1	Thermoelectric Cooler (+)	5	Laser Diode Anode
2	Thermistor	6	Monitor Diode Anode
3	Thermistor	7	Photo Diode Cathode
4	Laser Diode Cathode	8	Thermoelectric Cooler (-)

All 8 pins are isolated from case.

bottom view



Package Drawings



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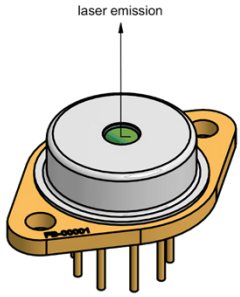
laser emission



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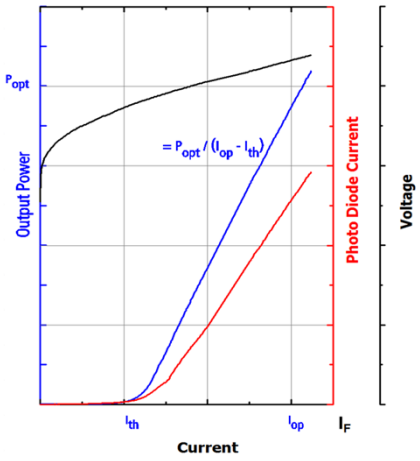
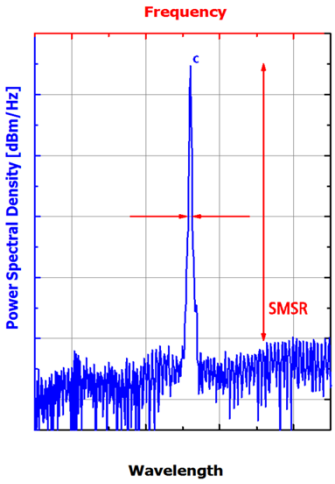
Typical Measurement Results

Output Power vs. Current



Spectra at Specified Optical Output Power



Performance figures, data and any illustrative material provided in this specification are typical and must be specifically confirmed in writing by eagleyard Photonics before they become applicable to any particular order or contract. In accordance with the eagleyard Photonics policy of continuous improvement specifications may change without notice.

Unpacking, Installation and Laser Safety

Unpacking the laser diodes should only be done at electrostatic safe workstations (EPA). Though protection against electro static discharge (ESD) is implemented in the laser package, charges may occur at surfaces. Please store this product in its original package at a dry, clean place until final use. During device installation, ESD protection has to be maintained.

The DFB laser is sensitive against optical feedback, so an optical isolator may be required in order to avoid any disturbance of the emission spectrum. Operating at moderate temperatures on proper heat sinks will contribute to a long lifetime of the diode.

Avoid direct and/or indirect exposure to the free running beam. Collimating and focussing the free running beam with optics as common in optical instruments will increase threat to the human eye.

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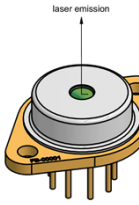

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
WAVELENGTH 1083 nm
MAX. OUTPUT POWER 90 mW

IEC-60825-0

Complies with 21 CFR 1040.10 and 1040.40