

CM96Z***-7*

Cooled 10pin butterfly 980nm Pump Laser Module

Features

- High output power, up to 600mW kink free
- Single-mode fiber pigtail
- Fiber Bragg grating stabilization for wavelength locking over the entire operating conditions
- Small form factor, hermetically sealed 10 pin mini-butterfly package
- Pin-out compatibility with 14 pin BTF package
- Internal thermoelectric heatpump and monitor photodiode
- Telcordia GR-468-CORE compliant
- Field-proven high reliability
- RoHS compliant

Applications

- Low noise EDFAs
- Dense wavelength division multiplexing (DWDM) EDFAs
- CATV Applications



Product Overview

These lasers are designed as pump sources for erbium doped fiber amplifier (EDFA) applications. Processes and techniques of coupling the fiber to the laser allow high output powers that are very stable with both time and temperature.

The CM96Z***-7* series pump module utilizes a fiber Bragg grating design for enhanced wavelength and power stability performance. This product has been designed to ensure superior wavelength locking over drive current, temperature and optical feedback changes.

Devices are available with kink free output powers to 600mW.

CM96Z***-7*

Optical Characteristics

Product Code	Minimum Kink-Free Power P _{kink} (mW)	Maximum Operating Power Pop (mW)	Maximum Operating Current I _{op} (mA)
CM96Z200-7*	200	180	375
CM96Z210-7*	210	190	395
CM96Z220-7*	220	200	410
CM96Z230-7*	230	210	430
CM96Z240-7*	240	220	450
CM96Z250-7*	250	225	460
CM96Z260-7*	260	235	475
CM96Z270-7*	270	245	495
CM96Z280-7*	280	255	510
CM96Z290-7*	290	265	530
CM96Z300-7*	300	275	545
CM96Z310-7*	310	280	555
CM96Z320-7*	320	290	575
CM96Z330-7*	330	300	595
CM96Z340-7*	340	310	610
CM96Z350-7*	350	320	630
CM96Z360-7*	360	325	640
CM96Z370-7*	370	335	655
CM96Z380-7*	380	345	675
CM96Z390-7*	390	355	695
CM96Z400-7*	400	365	710
CM96Z410-7*	410	375	730
CM96Z420-7*	420	380	740
CM96Z430-7*	430	390	755
CM96Z440-7*	440	400	775
CM96Z450-7*	450	410	795
CM96Z460-7*	460	420	810
CM96Z470-7*	470	425	820
CM96Z480-7*	480	435	840
CM96Z490-7*	490	445	855
CM96Z500-7*	500	455	875
CM96Z510-7*	510	465	895
CM96Z520-7*	520	475	910
CM96Z530-7*	530	480	920
CM96Z540-7*	540	490	940
CM96Z550-7*	550	500	955
CM96Z560-7*	560	510	975
CM96Z570-7*	570	520	995
CM96Z580-7*	580	525	1000
CM96Z590-7*	590	535	1000
CM96Z600-7*	600	545	1000

Notes:

1. Operating power assumes a 10% ageing margin: Operating Power = Kink-Free Power / 1.1

CM96Z***-7*

Wavelength Specification

Product Code		Min.	Typ.	Max.	Units	Condition
CM96Z***-74	λ_c	973	974	975	nm	Air reference. FBG temperatures is @ 25°C.
CM96Z***-76		975	976	977	nm	

Product Specification

Parameter		Min.	Typ.	Max.	Units	Condition
Threshold current	I_{th}		50	70	mA	
Operating forward voltage	V_{op}		1.7	2.0	V	
Spectral width	$\Delta\lambda$		0.2	1.0	nm	RMS at -13dB
Signal to noise ratio	SNR	20			dB	
Temperature dependence of peak wavelength	$\Delta\lambda/T$		0.008	0.01	nm/°C	FBG temperature dependency
Monitor detector responsivity	R_m	1	5	10	$\mu A/mW$	
Monitor dark current	I_{dark}			50	nA	-5V bias voltage
Fiber power stability >30mW 20 – 30mW 10 – 20mW 5 – 10mW	ΔP_{f_t}			0.08	dB	Peak-to-peak Time = 60sec DC to 50kHz
				0.08		
				0.10		
				0.15		
Return loss	RL	35			dB	1500nm – 1600nm
Thermistor BETA value	β	3500		4100	K	
Thermistor resistance	R_{th}	9.5	10.0	10.5	k Ω	At submount temperature of 25°C
Heat pump current	I_{TEC}			1.7	A	T _{case} = 75°C, IF= 1100mA
Heat pump voltage	V_{TEC}			2.6	V	
Heat pump power	P_{TEC}			4.4	W	
Total module power consumption	P_{Total}			6.6	W	

Notes;

1. Conditions unless otherwise stated: Case temperature -20 to 75°C, Monitor diode bias -5V, CW operation

CM96Z***-7*

Absolute Maximum Ratings

Parameter		Min.	Typ.	Max.	Units	Condition
Operating case temperature	T_{op}	-20		75	°C	
Storage temperature	T_{stg}	-40		85	°C	
Storage relative humidity	RH_{stg}	5		95	%	But not to exceed 0.024kg of water per 1.0kg of dry air
Operating relative humidity	RH_{op}	5		85	%	
Pigtail axial pull force				0.5	kg	1 minute
Pigtail side pull force				0.25	kg	90°, 4 directions, 5s
Fiber bend radius		13			mm	
Lead soldering temperature				350	°C	10 sec
Laser diode forward current	I_{f_max}			1100	mA	CW
Laser diode current transient				1200	mA	Time = 1000ns max
Laser diode reverse current	I_r			10	µA	
Laser diode reverse voltage	V_r			2.0	V	
Heat pump current	I_{TEC}	-2.2		2.2	A	Thermistor and TEC must be in closed control loop at all times
Heat pump voltage	V_{TEC}	-3.0		3.0	V	

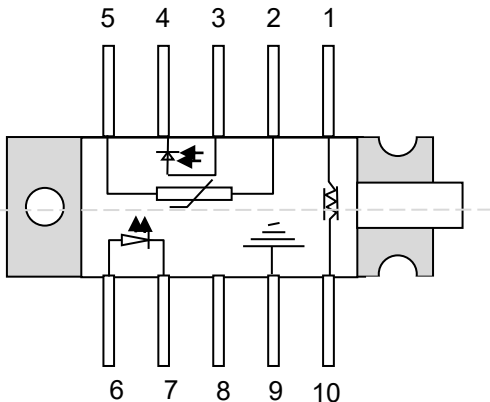
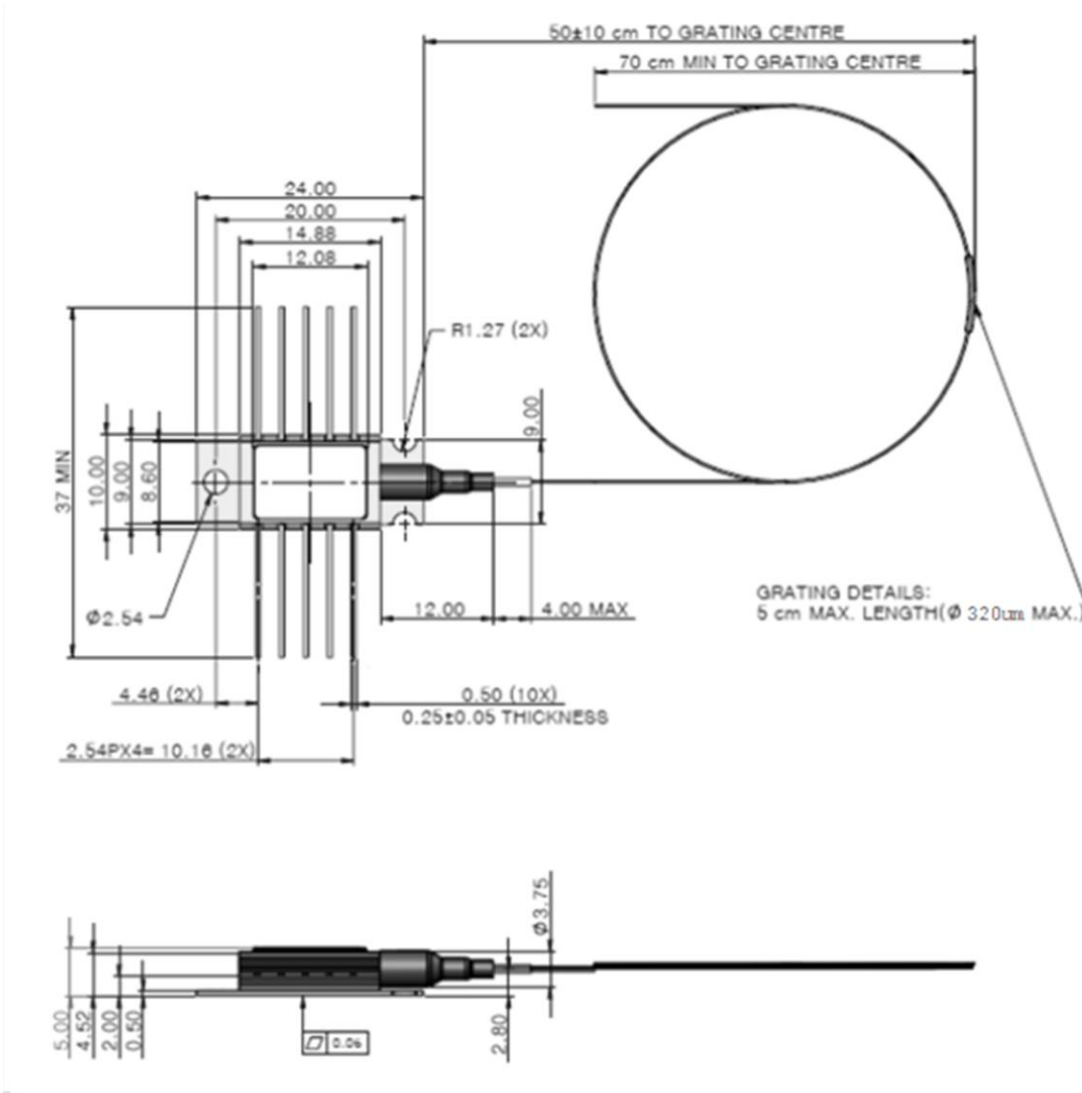
Fiber Specification

Parameter	Min.	Typ.	Max.	Units	Condition
Fiber type	HI1060				
Cut-off wavelength	870	920	970	nm	
Mode field diameter	5.6	5.9	6.2	µm	@ 980nm
Cladding diameter	124.5	125	125.5	µm	
Fiber coating diameter	235	245	255	µm	Acrylate material, mechanically strippable
Grating recoat diameter	260	290	320	µm	
Core/cladding concentricity			≤0.3	µm	
Fiber proof test	200			kpsi	
Fiber Bragg Grating proof test	150			kpsi	

1. Fiber termination: bare fiber with rough cleave

CM96Z***-7*

Module Outline Drawing and Pin Connections



Pin	Description	Pin	Description
1	TEC (+)	6	Laser anode (+)
2	Thermistor	7	Laser cathode (-)
3	Monitor anode (-)	8	NC
4	Monitor cathode (+)	9	Package ground
5	Thermistor	10	TEC (-)

CM96Z***-7*

Ordering Information

CM	96	Z	***	-	7*
Product Type	Chip Type	Product Design	LD Kink Free Power (mW)	-	Wavelength 74 for 974nm 76 for 976nm

Example: CM96Z200-74 is a 200mW Kink Free Power, 974nm product.

CM96Z***-7*

RoHS Compliance



II-VI Photonics is fully committed to environment protection and sustainable development and has set in place a comprehensive program for removing polluting and hazardous substances from all of its products. The relevant evidence of RoHS compliance is held as part of our controlled documentation for each of our compliant products. RoHS compliance parts are available to order, please refer to the ordering information section for further details.

User Safety



THIS PRODUCT COMPLIES WITH 21CFR 1040.10



REFERENCE IEC 60825-1 Edition 3.0



Caution - use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.


Important Notice

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CML96Z***-7*

Low Power Consumption Cooled 10pin butterfly 980nm Pump Laser Module

Features

- High output power, up to 600mW kink free
- Low power consumption
- Single-mode fiber pigtail
- Fiber Bragg grating stabilization for wavelength locking over the entire operating conditions
- Small form factor, hermetically sealed 10 pin mini-butterfly package
- Pin-out compatibility with 14 pin BTF package
- Internal thermoelectric heatpump and monitor photodiode
- Telcordia GR-468-CORE compliant
- Field-proven high reliability
- RoHS compliant 

Applications

- Low noise EDFAs
- Dense wavelength division multiplexing (DWDM) EDFAs
- CATV Applications



Product Overview

These lasers are designed as pump sources for erbium doped fiber amplifier (EDFA) applications. Processes and techniques of coupling the fiber to the laser allow high output powers that are very stable with both time and temperature.

The CML96Z***-7* series pump module utilizes a fiber Bragg grating design for enhanced wavelength and power stability performance. This product has been designed to ensure superior wavelength locking over drive current, temperature and optical feedback changes.

The CML96Z***-7* series pump module operate at significantly reduced TEC and overall power consumption.

Devices are available with kink free output powers to 600mW.

CML96Z***-7*

Optical Characteristics

Product Code	Minimum Kink-Free Power Pkink (mW)	Maximum Operating Power Pop (mW)	Maximum Operating Current Iop (mA)
CML96Z200-7*	200	180	375
CML96Z210-7*	210	190	395
CML96Z220-7*	220	200	410
CML96Z230-7*	230	210	430
CML96Z240-7*	240	220	450
CML96Z250-7*	250	225	460
CML96Z260-7*	260	235	475
CML96Z270-7*	270	245	495
CML96Z280-7*	280	255	510
CML96Z290-7*	290	265	530
CML96Z300-7*	300	275	545
CML96Z310-7*	310	280	555
CML96Z320-7*	320	290	575
CML96Z330-7*	330	300	595
CML96Z340-7*	340	310	610
CML96Z350-7*	350	320	630
CML96Z360-7*	360	325	640
CML96Z370-7*	370	335	655
CML96Z380-7*	380	345	675
CML96Z390-7*	390	355	695
CML96Z400-7*	400	365	710
CML96Z410-7*	410	375	730
CML96Z420-7*	420	380	740
CML96Z430-7*	430	390	755
CML96Z440-7*	440	400	775
CML96Z450-7*	450	410	795
CML96Z460-7*	460	420	810
CML96Z470-7*	470	425	820
CML96Z480-7*	480	435	840
CML96Z490-7*	490	445	855
CML96Z500-7*	500	455	875
CML96Z510-7*	510	465	895
CML96Z520-7*	520	475	910
CML96Z530-7*	530	480	920
CML96Z540-7*	540	490	940
CML96Z550-7*	550	500	955
CML96Z560-7*	560	510	975
CML96Z570-7*	570	520	995
CML96Z580-7*	580	525	1000
CML96Z590-7*	590	535	1000
CML96Z600-7*	600	545	1000

Notes:

1. Operating power assumes a 10% ageing margin: Operating Power = Kink-Free Power / 1.1

CML96Z***-7*

Wavelength Specification

Product Code		Min.	Typ.	Max.	Units	Condition
CML96Z***-74	λ_c	973	974	975	nm	Air reference. FBG temperatures is @ 25°C.
CML96Z***-76		975	976	977	nm	

Product Specification

Parameter		Min.	Typ.	Max.	Units	Condition
Threshold current	I_{th}		60	85	mA	
Operating forward voltage	V_{op}		1.7	2.0	V	
Spectral width	$\Delta\lambda$		0.2	1.0	nm	RMS at -13dB
Signal to noise ratio	SNR	20			dB	
Temperature dependence of peak wavelength	$\Delta\lambda/T$		0.008	0.01	nm/°C	FBG temperature dependency
Monitor detector responsivity	R_m	1	5	10	$\mu A/mW$	
Monitor dark current	I_{dark}			50	nA	-5V bias voltage
Fiber power stability >30mW 20 – 30mW 10 – 20mW 5 – 10mW	ΔP_{f_t}			0.08 0.08 0.10 0.15	dB	Peak-to-peak Time = 60sec DC to 50kHz
Return loss	RL	35			dB	1500nm – 1600nm
Thermistor BETA value	β	3500		4100	K	
Thermistor resistance	R_{th}	9.5	10.0	10.5	k Ω	At submount temperature of 40°C
Heat pump current	I_{TEC}			1.3	A	T _{case} = 75°C, IF= 1100mA
Heat pump voltage	V_{TEC}			2.1	V	
Heat pump power	P_{TEC}			2.7	W	
Total module power consumption	P_{Total}			4.9	W	

Notes;

1. Conditions unless otherwise stated: Case temperature -20 to 75°C, Monitor diode bias -5V, CW operation

CML96Z***-7*

Absolute Maximum Ratings

Parameter		Min.	Typ.	Max.	Units	Condition
Operating case temperature	T_{op}	-20		75	°C	
Storage temperature	T_{stg}	-40		85	°C	
Storage relative humidity	RH_{stg}	5		95	%	But not to exceed 0.024kg of water per 1.0kg of dry air
Operating relative humidity	RH_{op}	5		85	%	
Pigtail axial pull force				0.5	kg	1 minute
Pigtail side pull force				0.25	kg	90°, 4 directions, 5s
Fiber bend radius		13			mm	
Lead soldering temperature				350	°C	10 sec
Laser diode forward current	I_{f_max}			1100	mA	CW
Laser diode current transient				1200	mA	Time = 1000ns max
Laser diode reverse current	I_r			10	µA	
Laser diode reverse voltage	V_r			2.0	V	
Heat pump current	I_{TEC}	-2.2		2.2	A	Thermistor and TEC must be in closed control loop at all times
Heat pump voltage	V_{TEC}	-3.0		3.0	V	

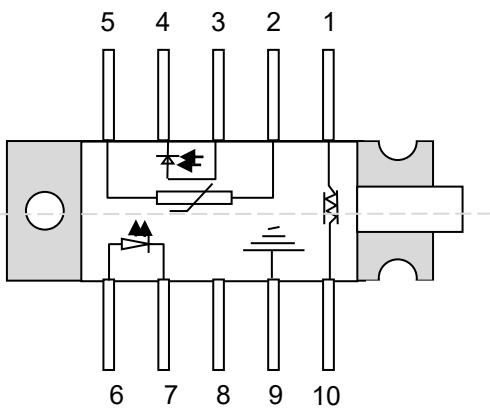
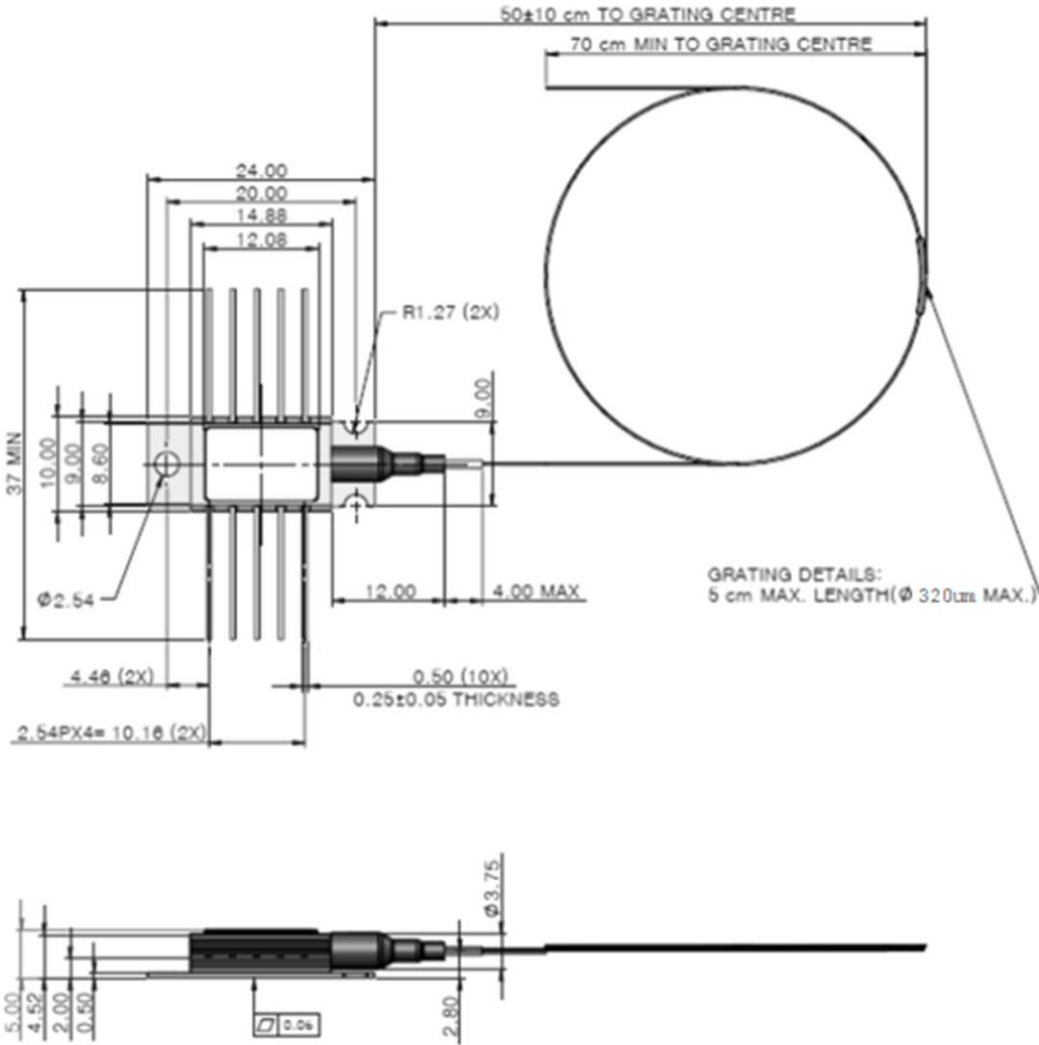
Fiber Specification

Parameter	Min.	Typ.	Max.	Units	Condition
Fiber type	HI1060				
Cut-off wavelength	870	920	970	nm	
Mode field diameter	5.6	5.9	6.2	µm	@ 980nm
Cladding diameter	124.5	125	125.5	µm	
Fiber coating diameter	235	245	255	µm	Acrylate material, mechanically strippable
Grating recoat diameter	260	290	320	µm	
Core/cladding concentricity			≤0.3	µm	
Fiber proof test	200			kpsi	
Fiber Bragg Grating proof test	150			kpsi	

1. Fiber termination: bare fiber with rough cleave

CML96Z***-7*

Module Outline Drawing and Pin Connections



Pin	Description	Pin	Description
1	TEC (+)	6	Laser anode (+)
2	Thermistor	7	Laser cathode (-)
3	Monitor anode (-)	8	NC
4	Monitor cathode (+)	9	Package ground
5	Thermistor	10	TEC (-)

CML96Z***-7*

Ordering Information

CML	96	Z	***	-	7*
Product Type	Chip Type	Product Design	LD Kink Free Power (mW)	-	Wavelength 74 for 974nm 76 for 976nm

Example: CML96Z200-74 is a 200mW Kink Free Power, 974nm product.

CML96Z***-7*

RoHS Compliance



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User Safety



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UM96Z***-7*

High Power Uncooled mBTF 980nm Pump Laser Module

Features

- Up to 500mW kink-free power over full operating temperature range
- Operating temperature range from -5°C to +75°C (case)
- Polarization maintaining (PM) fiber
- Low power dissipation
- Small form factor 10pin mini-butterfly (mBTF) package offers pinout compatibility with 14pin-BTF package
- Wavelength stabilized by fiber Bragg grating over entire operating range
- Centre wavelength at 974 and 976nm
- Telcordia GR-468-CORE compliant
- RoHS compliant 

Applications

- Low noise EDFA requiring higher optical power with low power consumption and small form-factor package
- Single or multi-stage EDFA applications including Single-channel and DWDM designs



Product Overview

The high power, extended temperature UM96Z-series uncooled laser module in a 10-Pin mBTF package is II-VI's third-generation uncooled pump module providing higher powers and lower consumption.

This laser enables designers to create reliable SFF single- and multi-channel, high bit-rate, per-channel amplification as well as replace traditional cooled pumps in high power EDFA applications with reduced power consumption.

The UM96Z-series uses a 10-pin mBTF package enabling smaller form factor designs, with mounting holes for ease of integration and thermal management. The 10-pin mBTF package is backward compatible with 14pin BTF package footprint and pinout.

The UM96Z-series is designed for uncooled operation at high temperature and power levels. Qualification of the enhanced G08 chip ensures high reliability even at 460mW operating power, 75°C. External Fiber Bragg Grating (FBG) stabilization provides excellent wavelength and power stability over the entire operating temperature range.

UM96Z-Series

Operating Parameter

Product Code	Minimum Kink-Free Power P_{kink} (mW)	Maximum Operating Power P_{op} (mW)	Typical Operating Current I_{op} (mA)	Maximum Operating Current I_{op} (mA)
UM96Z280-7*	310	280	560	635
UM96Z290-7*	320	290	585	660
UM96Z300-7*	330	300	600	680
UM96Z310-7*	340	310	615	695
UM96Z320-7*	350	320	630	715
UM96Z330-7*	365	330	655	740
UM96Z340-7*	375	340	670	760
UM96Z350-7*	385	350	690	785
UM96Z360-7*	395	360	710	805
UM96Z370-7*	405	370	730	830
UM96Z380-7*	420	380	745	845
UM96Z390-7*	430	390	765	865
UM96Z400-7*	440	400	780	885
UM96Z410-7*	450	410	805	915
UM96Z420-7*	460	420	820	930
UM96Z430-7*	475	430	840	950
UM96Z440-7*	485	440	855	970
UM96Z450-7*	495	450	875	985
UM96Z460-7*	505	460	895	1000

Notes;

1. Typical and maximum operating currents at 75°C
2. Operating power assumes a 10% ageing margin: Operating Power = Kink Free Power / 1.1

UM96Z-Series

Wavelength Specification

Product Code	Min.	Typ.	Max.	Units	Condition
UM96Zxxx-74	973	974	975	nm	Air reference. FBG temperatures is @ 25°C.
UM96Zxxx-76	975	976	977		

Product Specification

Parameter		Min.	Typ.	Max.	Units	Condition
Threshold current	I _{th}		55	100	mA	
Operating forward voltage	V _{op}		1.85	2.0	V	
Spectral width	$\Delta\lambda$		0.2	1.0	nm	RMS at -13dB
Power in band ratio >100mW 50mW to 100mW	PIB	90 75			%	$\lambda_c \pm 1.5\text{nm}$, -5°C to 75°C
Temperature dependence of peak wavelength	$\Delta\lambda/\Delta T$		0.008	0.01	nm/°C	FBG temperature dependency
Monitor detector responsivity	R _m	0.3	6	15	$\mu\text{A/mW}$	
Monitor dark current	I _{dark}			60	nA	-5V bias voltage
Fiber power stability >30mW 20 – 30mW 10 – 20mW 5 – 10mW	ΔP_{f_t}			0.10 0.10 0.15 0.20	dB	Peak-to-peak Time = 60sec DC to 50kHz
Return loss	RL	35			dB	1500nm – 1600nm
Thermistor BETA value	β	3500		4100		
Thermistor resistance	R _{th}	9.5	10.0	10.5	k Ω	At submount temperature of 25°C
Thermal power dissipation	P _{thermal}		1.35	1.75	W	T _{case} = 75°C, 460mW
Total electrical power consumption	P _{total}		1.8	2.2	W	

Notes;

- Conditions unless otherwise stated: Case temperature -5 to 75°C, Monitor diode bias -5V, CW operation

UM96Z-Series

Absolute Maximum Ratings

Parameter		Min.	Typ.	Max.	Units	Condition
Operating case temperature	Top	-5		75	°C	
Storage temperature	Tstg	-40		85	°C	
Storage relative humidity	RHstg	5		95	%	But not to exceed 0.024kg of water per 1.0kg of dry air
Operating relative humidity	RHop	5		85	%	
Pigtail axial pull force				0.5	kg	1 minute
Pigtail side pull force				0.25	kg	90°, 4 directions, 5s
Fiber bend radius		13			mm	
Lead soldering temperature				350	°C	10 sec
Laser diode forward current	If_max			1100	mA	CW
Laser diode current transient				1200	mA	Time = 1000ns max.
Laser diode reverse current	I _r			10	μA	
Laser diode reverse voltage	V _r			2.0	V	
Photodiode reverse voltage				20	V	
Photodiode reverse current				5	mA	
ESD threshold				500	V	HBM, C=100pF, R=1.5kΩ

Fiber Specification

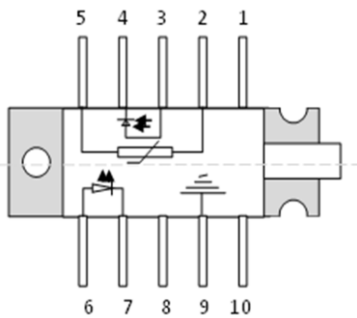
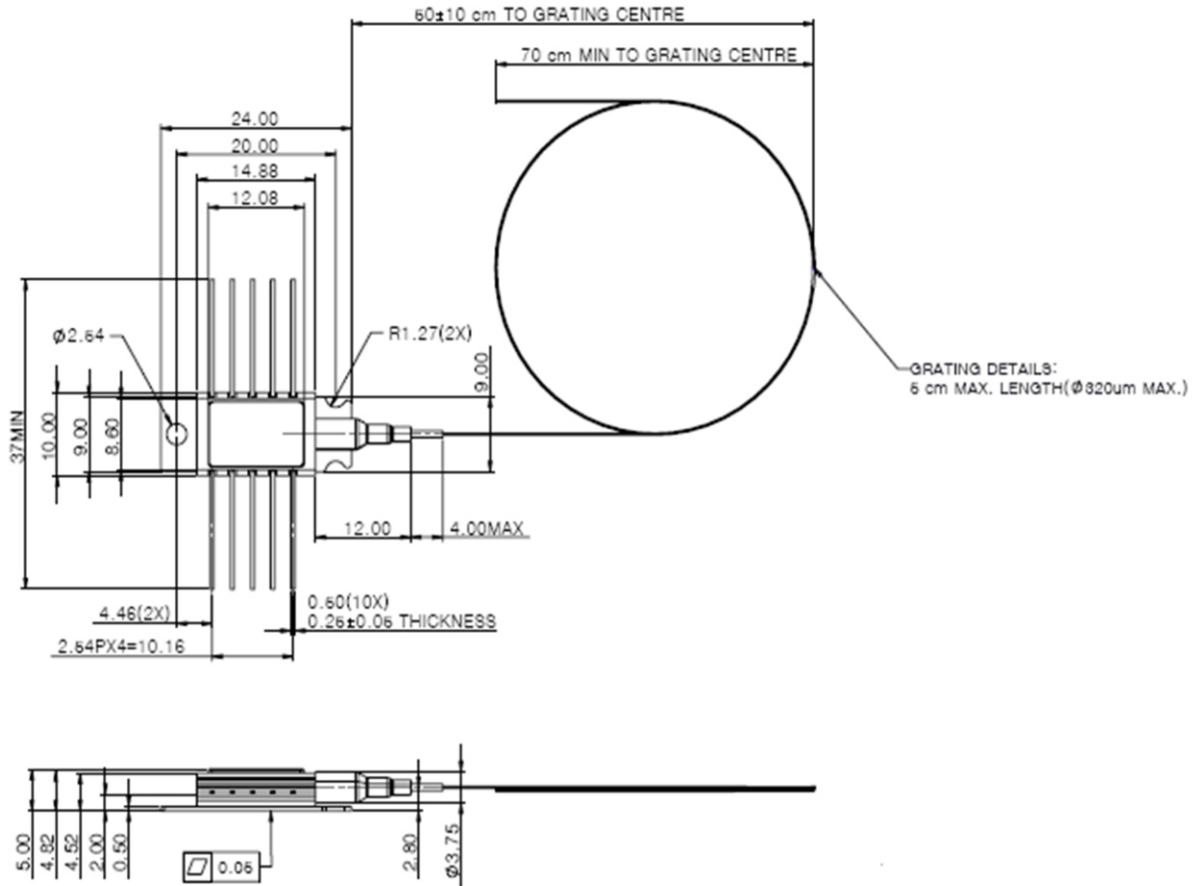
Parameter	Min.	Typ.	Max.	Units	Condition
Fiber type	PM980				
Cut-off wavelength	870	920	970	nm	
Mode field diameter	6.1	6.6	7.1	μm	@ 980nm
Cladding diameter	124	125	126	μm	
Fiber coating diameter	230	245	260	μm	Acrylate material, mechanically strippable
Grating recoat diameter	260	290	320	μm	
Core/cladding concentricity			<0.5	μm	
Coating-clad offset			≤5	μm	
Fiber proof test	200			kpsi	
Fiber Bragg Grating proof test	150			kpsi	

Notes;

1. Fiber termination; bare fiber with rough cleave.

UM96Z-Series

Module Outlines Drawing and Pin Connections



Pin	Description	Pin	Description
1	NC	6	Laser anode (+)
2	Thermistor	7	Laser cathode (-)
3	Monitor anode (-)	8	NC
4	Monitor cathode (+)	9	Package ground
5	Thermistor	10	NC

UM96Z-Series

Ordering Information

UM	96Z	xxx	-	7x
Product Type	Chip Type	LD Operating Power (mW)	-	Wavelength 74 for 974nm 76 for 976nm

Example: UM96Z310-74 is a 310mW Operating Power, 974nm product.

UM96Z-Series

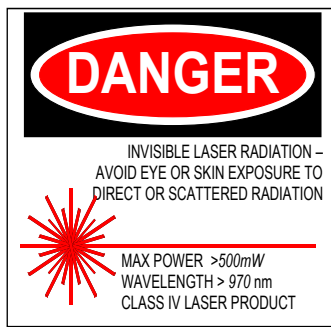
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User Safety

The laser light is invisible and maybe harmful to human eyes. ESD protection, it is important that devices are handled correctly during all stages of manufacture and use.



THIS PRODUCT COMPLIES WITH 21CFR 1040.10



REFERENCE IEC 60825-1 Edition 3.0



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This product is protected by patents and patent applications pending worldwide