

## Active Components Pump Laser Modules

### Key Features

Up to 430 mW operating power

Operating temperature up to 75 °C

Fiber Bragg Grating (FBG) on SMF

Total Power Consumption:  
6.0 W max @ 430 mW Pop

Telcordia GR-468-CORE qualified

RoHS compliant

### Applications

High output power low noise  
Erbium-Doped Fiber Amplifier

Multi pumping architectures

Sensors

### For more Info

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## 1999HPM

### 475 mW Kink-Free, FBG Stabilized, 980 nm Cooled Pump Laser Module

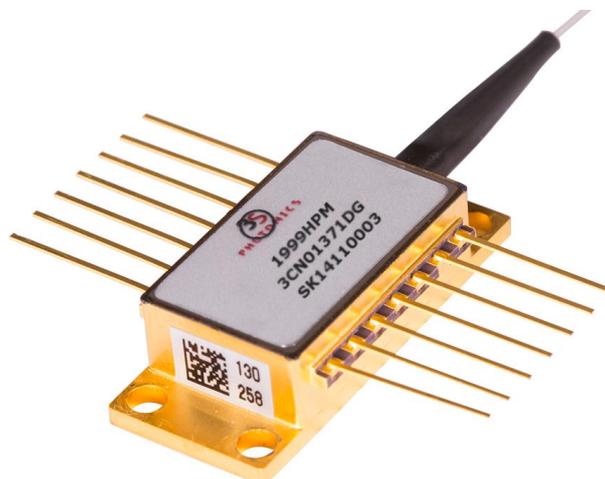
The 1999HPM is a new generation of 980 nm terrestrial pump modules powered by in-house chip technology fully qualified for submarine applications, ensuring an outstanding level of performance, power consumption and reliability.

Low Profile, 14-pin butterfly modules are available with an operating power up to 430 mW.

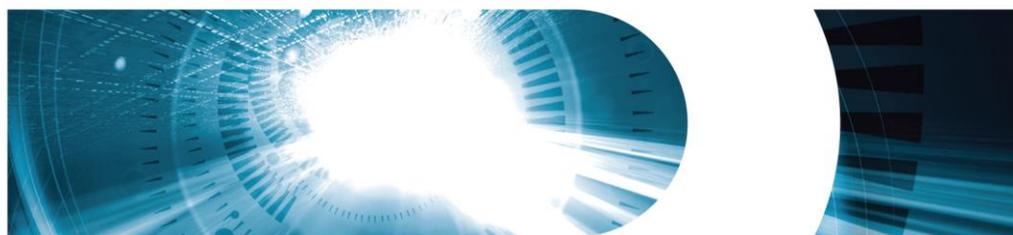
They incorporate a thermoelectric cooler (TEC), a precision NTC thermistor and a back-facet monitoring photodiode.

The wavelength is "locked" utilizing a fiber bragg grating (FBG) located in a Single Mode HI1060 Fiber (SMF) pigtail.

The module meets the Telcordia™ GR-468-Core requirements for hermetic 980 nm pump modules.



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## ELECTRO-OPTICAL CHARACTERISTICS

The following parameters are specified BOL for a  $T_{\text{case}} = -5\text{ }^{\circ}\text{C}$  to  $75\text{ }^{\circ}\text{C}$ ,  $V_{\text{BFM}} = -5\text{ V}$  and  $-50\text{ dB}$  max back-reflection unless otherwise stated.

Parameters	Conditions	Symbol	Min	Typ	Max	Unit
<b>PUMP LASER</b>						
Threshold current (1)		$I_{\text{th}}$	-	45	60	mA
Nominal operating power		$P_{\text{nom}}$	350	-	430	mW
Kink free power (2)		$P_{\text{kink}}$	$1.1 \times P_{\text{nom}}$	-	-	mW
Forward current (3)	$P_{\text{nom}} = 350\text{ mW}$	$I_{\text{nom}}$	-	525	590	mA
	$P_{\text{nom}} = 360\text{ mW}$		-	540	605	
	$P_{\text{nom}} = 400\text{ mW}$		-	600	670	
	$P_{\text{nom}} = 410\text{ mW}$		-	620	685	
	$P_{\text{nom}} = 430\text{ mW}$		-	645	700	
Forward voltage	@ 430 mW	$V_{\text{nom}}$	-	1.8	2.1	V
Peak wavelength tolerance	@ $T_{\text{case}} = T_{\text{FBG}} = 25\text{ }^{\circ}\text{C}$ $0.1 \times P_{\text{nom}}$ to $P_{\text{nom}}$	$\Delta\lambda_p$	-	-	$\pm 0.5$	nm
Wavelength tuning vs temperature ( $T_{\text{grating}} = -5$ to $75\text{ }^{\circ}\text{C}$ )	$0.1 \times P_{\text{nom}}$ to $P_{\text{nom}}$	$\Delta\lambda_p / \Delta T$	-	0.01	0.02	nm / $^{\circ}\text{C}$
Spectral width @ -3 dB	$0.1 \times P_{\text{nom}}$ to $P_{\text{nom}}$	$\Delta\lambda_{\text{FWHM}}$	-	-	1.0	nm
Power in band (4)	$P_{\text{nom}}$	$P_{\text{band}}$	90	-	-	%
Optical power stability	Peak to peak, 10 Hz-50 kHz, 60 sec, $P_{\text{nom}}$	$\Delta P$	-	<1	2	%
Power consumption, EOL	$P_{\text{nom}} = 430\text{ mW}$		-	-	6.0	W
<b>MONITOR DIODE</b>						
Responsivity		$I_{\text{BFM}} / P$	0.5	-	10	$\mu\text{A} / \text{mW}$
Dark current	$V_r = 5\text{ V}$	$I_{\text{BFM, dark}}$	-	50	100	nA
<b>THERMO-ELECTRICAL COOLER</b>						
Cooling capacity		$\Delta T_{\text{TEC}}$	50	-	-	$^{\circ}\text{C}$
TEC voltage (EOL)	$T_{\text{case}} = 75\text{ }^{\circ}\text{C}$ , $1.1 \times I_{\text{nom}}$	$V_{\text{TEC, EOL}}$	-	-	2.5	V
TEC current (EOL)		$I_{\text{TEC, EOL}}$	-	-	2.0	A
TEC Power consumption		$P_{\text{TEC}}$	-	-	5.0	W
<b>THERMISTOR</b>						
Resistance	$25\text{ }^{\circ}\text{C}$	$R_{\text{th}}$	9.5	10	10.5	k $\Omega$
Constant		B	3600	-	4200	K

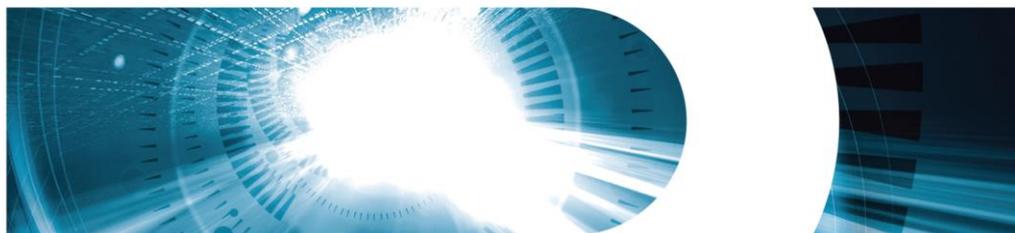
(1)  $I_{\text{th}}$  is the intersection point with the x-axis of a linear fit of the P(I) curve between 15 mW and 50 mW

(2) A kink is detected when the local slope  $dP/dI$  is below  $S_{\text{min}}$  or above  $S_{\text{max}}$ .  $S_{\text{min}}$  is defined as  $0.5 \times S_{\text{avg}}$  and  $S_{\text{max}}$  is defined as  $1.5 \times S_{\text{avg}}$

(3) EOL forward current  $I(\text{EOL}) = 1.1 \times I(\text{BOL})$

(4)  $P_{\text{band}}$  is defined as the power within the band  $\lambda_p \pm 1.5\text{ nm}$  vs the total output power

**475 mW Kink-Free,  
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## ABSOLUTE MAXIMUM RATINGS

Exposing this device to stresses and conditions above those listed in this section could cause permanent damage and affect reliability. The device is not meant to operate outside the operational limits described in previous section at any length of time.

Parameter Conditions	Symbol	Min	Max	Unit
Storage temperature (2000 h)	$T_{stg}$	-40	85	°C
Operating temperature ( $T_{submount} = 25\text{ °C}$ )	$T_{op}$	-5	75	°C
Lead soldering temperature (10 s maximum)		-	280	°C
LD forward drive current (10 s maximum)	$I_{f\_max}$	-	800	mA
LD reverse voltage	$V_{r\_max}$	-	2.0	V
PD reverse voltage	$V_{PD\_max}$	-	15	V
PD forward current	$I_{PD\_max}$	-	10	mA
TEC voltage	$V_{TEC\_C\_max}$	-	3.3	V
TEC current	$I_{TEC\_C\_max}$	-	2.4	A
ESD* damage	$V_{ESD}$	-	1000	V
Mounting torque		-	150	mN.m
Fiber bend radius		25	-	mm
Axial pull force (1x1min)		-	5	N

\* Human Body model, C = 100 pF, R = 1.5 k $\Omega$

## FIBER PIGTAIL CHARACTERISTICS

Parameter	Note	Min	Typ	Max	Unit
Fiber type		HI1060™ or equivalent			
Coating diameter	(except along grating)	230	250	270	$\mu\text{m}$
FBG recoat diameter		-	-	400	$\mu\text{m}$
FBG position	Module to center of FBG	-	2	-	m
Loose tube buffer diameter		885	-	915	$\mu\text{m}$
Fiber proof test level		200	-	-	kpsi
Grating proof test level		150	-	-	kpsi
Pigtail termination	Bare fiber				
Polarization State	Aligned parallel to the slow axis				

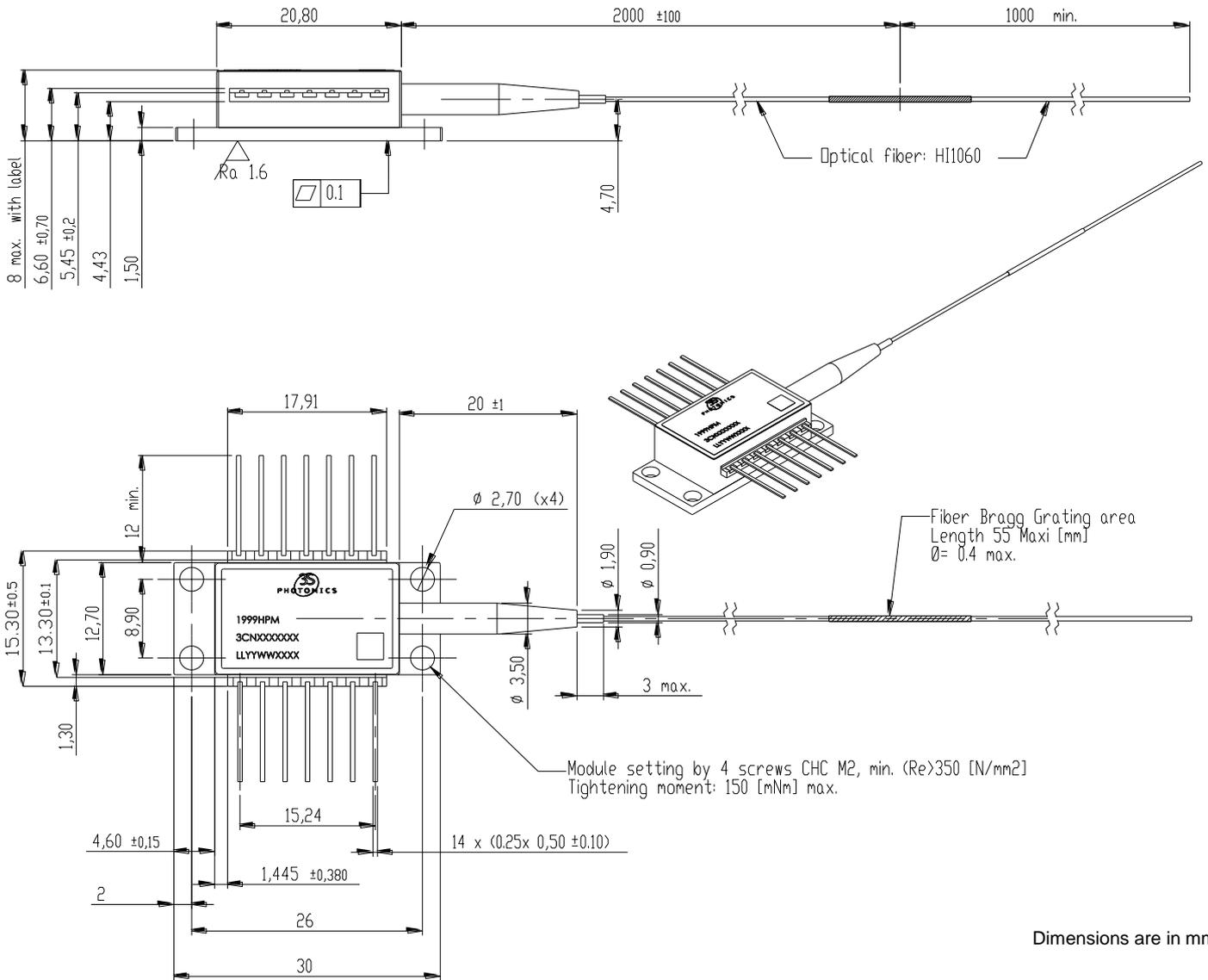
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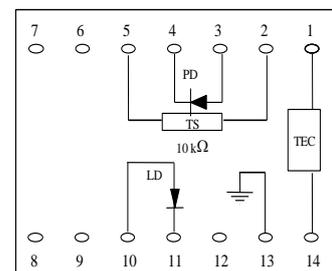


## MECHANICAL DETAILS



## PIN ASSIGNMENT

N°	Description	N°	Description
1	TEC (+)	8	No connect
2	Thermistor	9	No connect
3	Monitor PD Anode	10	Laser Anode (+)
4	Monitor PD Cathode	11	Laser Cathode (-)
5	Thermistor	12	No connect
6	No connect	13	Ground
7	No connect	14	TEC (-)

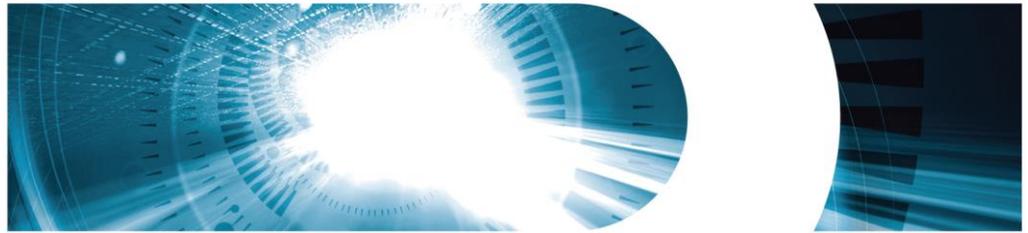


Totally floating pin-out

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## LASER SAFETY INFORMATION

This laser module emits invisible light. Take appropriate precautions to prevent undue exposure to naked eye when module is in operation. This product is classified Class 4 Laser Product according to IEC-60825-1.

## HANDLING

This product is sensitive to electrostatic discharge and should not be handled except at a static free workstation. Take precautions to prevent ESD; use wrist straps, grounded work surfaces and recognized anti-static techniques when handling the pump laser module. Caution! Handle the module by its package only; never hold it by its pigtail. Care should be taken to avoid supply transient currents and voltages. Drive voltage above the maximum specified in absolute maximum rating section may cause permanent damage to the device.



## APPLICATION NOTE

In order to prevent any mishandling, misuse, neglect or accident, it is highly recommended to read and follow the instructions detailed in the application note:

[RCL IMA APN 000 00007 "Handling, Mounting, Testing and Operating Cooled 14-pin Butterfly Laser Pumps"](#)

## ORDERING INFORMATION

### 1999HPM PUMP PRODUCT FAMILY

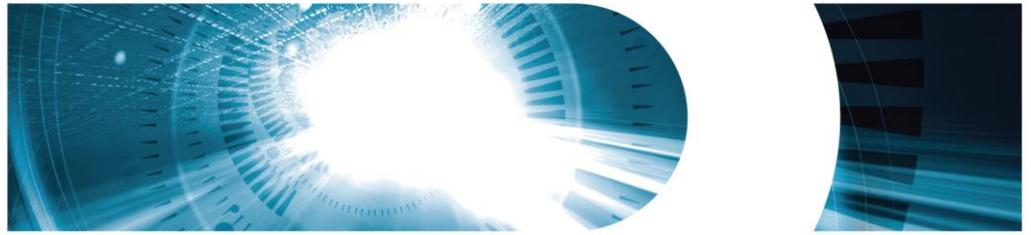
SMF pigtail	$\lambda_p = 974.5 \text{ nm}$ , $T = 25 \text{ }^\circ\text{C}$	$\lambda_p = 976.0 \text{ nm}$ , $T = 25 \text{ }^\circ\text{C}$
Nominal Power	Part Number	Part Number
350 mW	3CN01174CL	3CN01371CL
460 mW	3CN01174CN	3CN01371CN
400 mW	3CN01174DA	3CN01371DA
410 mW	3CN01174DC	3CN01371DC
430 mW	3CN01367DG	3CN01371DG

3SPGroup can also develop custom products to meet a wide range of technical requirements. Please contact your Sales Manager for details.

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## CONTACT INFORMATION

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## IMPORTANT NOTICE

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Information is subject to change without notice.

## NOTES