

## Active Components Pump Laser Modules

## DATASHEET

### Key Features

Operating Power up to 400mW

Ultra-Low Power Consumption

Operating Temperature from -5 to 70°C

Wavelength stabilization with FBG on PMF pigtail

Integrated Thermo-Electric Cooler, Thermistor

Telcordia GR-468-CORE qualified

RoHs 6/6

### Applications

Raman Amplifier

### For more info

Please contact us at:

North America: 514.748.4848  
888.922.1044

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or via e-mail at [sales@3spgroup.com](mailto:sales@3spgroup.com)

## 1943 RAM

### Up to 400mW FBG Stabilized 14xx nm Pump Laser Module Ultra-Low Power Consumption

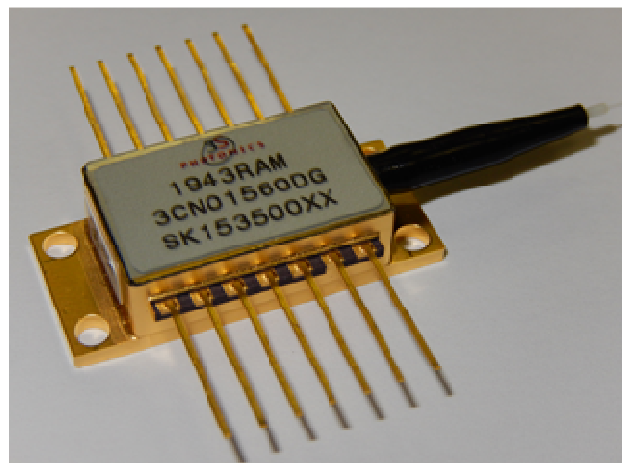
The 1943RAM is a new generation of Ultra-Low Power Consumption 14xx nm pump module designed for Raman amplification powered by an in-house chip technology leading to outstanding level of performance, power consumption and reliability.

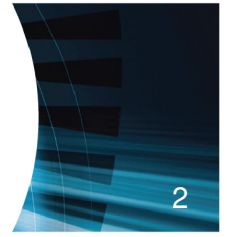
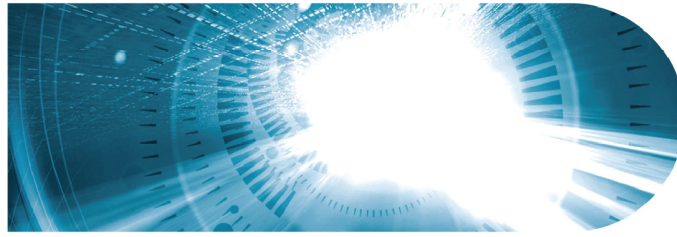
Low Profile 14-pin butterfly modules are available with operating powers of 360 & 400mW over a wavelength range from 1420nm to 1500nm and an extended case temperature range from -5 to 70°C. They incorporate a thermoelectric cooler (TEC), a precision NTC.

The wavelength is "locked" utilizing a Fiber Bragg Grating (FBG) located in a single mode Polarization Maintaining Fiber (PMF).

The module meets Telcordia™ GR-468-Core requirements for hermetic 14xx nm pump modules.

Without Monitoring Photo-Diode (MPD)





## ELECTRO-OPTICAL CHARACTERISTICS (1)

The following parameters are specified Beginning of Life (BOL) for  $T_{\text{SUBMOUNT}} = 40^\circ\text{C}$ ,  $T_{\text{case}} = -5$  to  $70^\circ\text{C}$ ,  $P_{\text{op}} = P_{\text{nom}}$ , unless otherwise stated.

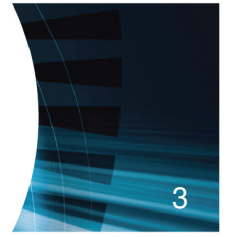
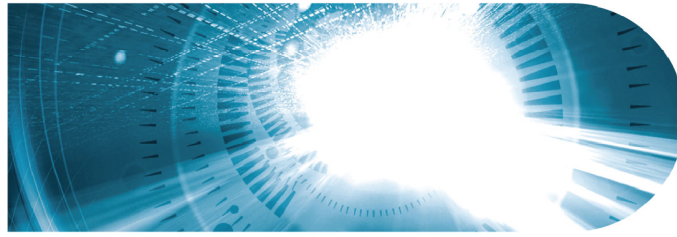
Parameters	Conditions	Symbol	Min	Typ	Max	Unit
<b>PUMP LASER</b>						
Threshold current (1)	-	$I_{\text{th}}$	-	-	220	mA
Forward current @ $P_{\text{nom}}$	$P_{\text{nom}} = 360\text{mW}$	$I_{\text{op}}$	-	-	1550	mA
	$P_{\text{nom}} = 400\text{mW}$		-	-	1670	mA
Operating current (End of Life)	$P_{\text{nom}} = 360 \text{ \& } 400 \text{ mW}$	$I_{\text{op EOL}}$	-	-	$1.15 \times I_{\text{op}}$	mA
Forward voltage	$P_{\text{nom}} = 360\text{mW}$	$V_{\text{nom EOL}}$	-	-	2,2	V
	$P_{\text{nom}} = 400\text{mW}$		-	-		V
Minimum Operating Power		$P_{\text{min}}$	75			mW
Target wavelength (in vacuum)	$P_{\text{nom}} \text{ \& } T_{\text{FBG}} = 25^\circ\text{C}$	$\lambda_t$	1420	-	1500	nm
Center wavelength	$P_{\text{nom}}$ , $T_{\text{case}} = T_{\text{FBG}} = 25^\circ\text{C}$	$\lambda_c$			$\pm 0.5$	nm
Spectral Bandwidth RMS	$P_{\text{op}}$ , RMS	$\Delta\lambda_{\text{FWHM}}$	-		2	nm
Power in band ( $\lambda_t \pm 2\text{nm}$ )	$I(100\text{mW}) < I < I_{\text{op}}$	$P_{\text{band}}$	80	-	-	%
Polarization Extinction Ratio	$P_{\text{nom}}$	PER	13	-	-	dB
Relative Intensity Noise	100kHz-1GHz	RIN			-105	dB/Hz
Side Mode Suppression Ratio	$P_{\text{nom}}$	SMSR	20	-	-	dB
	$P_{\text{min}}$		10			dB
Center wavelength variation vs FBG Temperature		$\Delta\lambda/\Delta T_{\text{FBG}}$	-	0.01	0.02	nm/ $^\circ\text{C}$

(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

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FBG Stabilized 14xx nm  
Pump Laser Module

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## ELECTRO-OPTICAL CHARACTERISTICS (2)

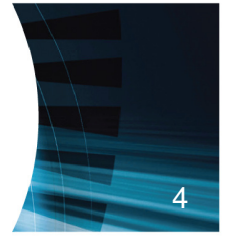
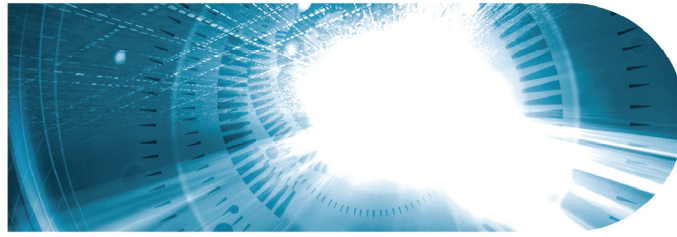
The following parameters are specified BOL for  $T_{\text{SUBMOUNT}} = 40^\circ\text{C}$ ,  $T_{\text{case}} = -5$  to  $70^\circ\text{C}$ ,  $P_{\text{op}} = P_{\text{nom}}$ , unless otherwise stated.

Parameters	Conditions	Symbol	Min	Typ	Max	Unit
<b>THERMO-ELECTRICAL COOLER</b>						
Cooling capacity		$\Delta T_{\text{TEC}}$			30	$^\circ\text{C}$
TEC voltage (EOL)	$P_{\text{nom}} = 360\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$	$V_{\text{TEC, EOL}}$			2.4	V
	$P_{\text{nom}} = 400\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$				2.65	V
TEC current (EOL)	$P_{\text{nom}} = 360\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$	$I_{\text{TEC, EOL}}$			1.4	A
	$P_{\text{nom}} = 400\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$				1.65	A
Total Power consumption	$P_{\text{nom}} = 360\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$	$P_{\text{TEC, EOL}}$			5.5	W
	$P_{\text{nom}} = 400\text{mW} @ T_{\text{case}} = 70^\circ\text{C}$				6.5	W
<b>THERMISTOR</b>						
Thermistor Resistance	$T_{\text{submount}} = 25^\circ\text{C}$	$R_{\text{th}}$	9.5	10	10.5	k $\Omega$
	$T_{\text{submount}} = 40^\circ\text{C}$		5.0		5.6	
Thermistor $\beta$ Constant		$T_C$	3700	-	4100	K

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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 (2000h)	$T_{stg}$	-40	85	°C
Operating temperature ( $T_{submount} = 40\text{°C}$ )*	$T_{op}$	-5	70	°C
Lead soldering temperature (10s maximum)		-	280	°C
LD forward drive current	$I_{f\_max}$	-	2000	mA
LD reverse voltage	$V_{r\_max}$	-	2	V
LD Fwd Current	$I_{rev}$	-	10	μA
TEC voltage, Cooler mode	$V_{TEC\_C\_max}$	-	4.2	V
TEC current, Cooler mode	$I_{TEC\_C\_max}$	-	2.0	A
ESD damage**	$V_{ESD}$	-	500	V
Mounting torque		-	150	mNm
Fiber temperature		-40	85	°C
Fiber bend radius		20	-	mm
Axial pull force (1x 1min)		-	5	N

\* No cold start. TEC will be turned-on first.

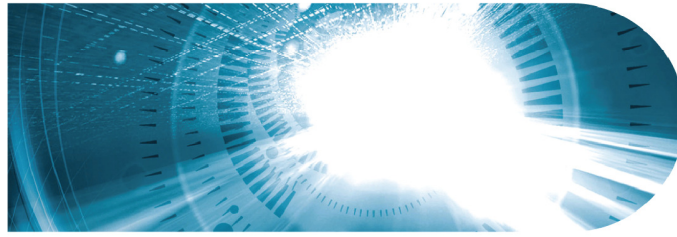
\*\* Human Body model, C= 100pF, R= 1.5kΩ

## FIBER PIGTAIL CHARACTERISTICS

Parameter	Note	Min	Typ	Max	Unit
Fiber type		Corning PM15-U25D Specification			
Cut-off wavelength		1290		1410	nm
Extinction Ratio			30		dB/100m
Mode field diameter	@1550nm	9.5		11.5	μm
UV Coating diameter	(except along grating)	230	245	260	μm
Cladding diameter		122	125	128	μm
FBG recoat diameter		260	295	400	μm
FBG position to module	Module to center of FBG	-	2.5	-	m
FBG position to end pigtail	Edge of FBG recoat to end pigtail distance	0.5	-	-	m
Fiber bend radius		20	-	-	mm
Splice distance from package (Optional)		0,3	-	-	m
Pigtail length		-	3.4	-	m
Polarization State	Aligned parallel to the slow axis				

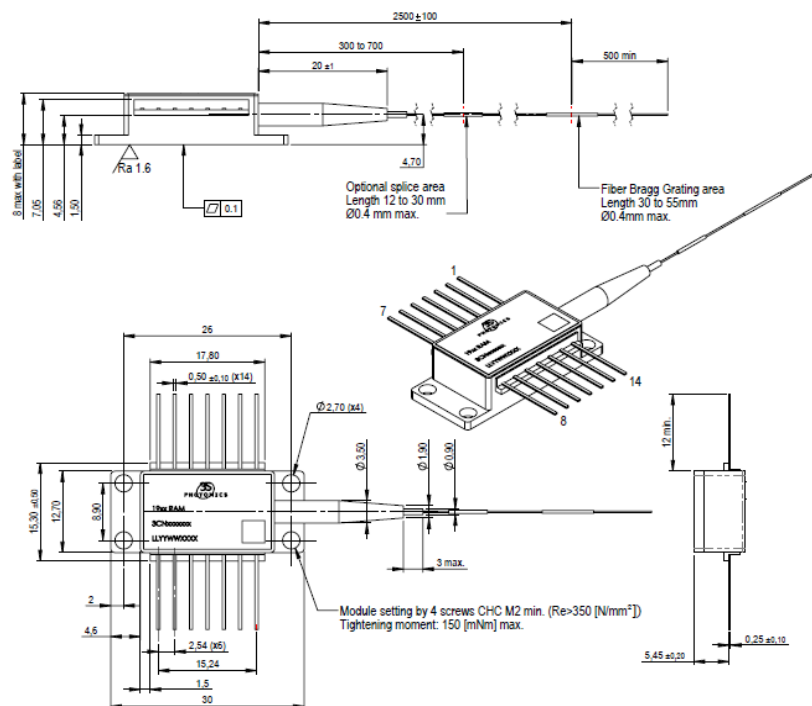
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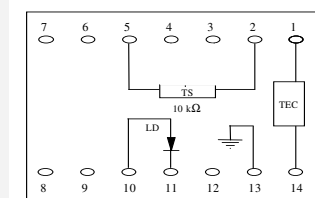
## MECHANICAL DETAILS

Dimensions are in mm.



## PIN ASSIGNMENT

N°	Description (without MPD)	N°	Description
1	TEC (+)	14	TEC (-)
2	Thermistor (TS)	13	Ground
3	No connect	12	No connect
4	No connect	11	Laser Diode Cathode (-)
5	Thermistor (TS)	10	Laser Diode Anode (+)
6	No connect	9	No connect
7	No connect	8	No connect

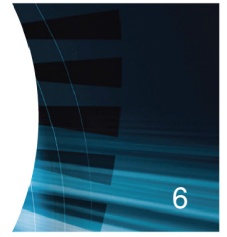
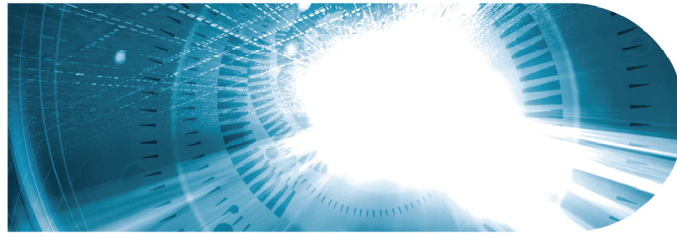


TOTALLY FLOATING PIN-OUT

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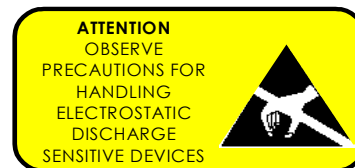
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## LASER SAFETY INFORMATION

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 modules. 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 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 product may cause permanent damage to the device.



## APPLICATION NOTE

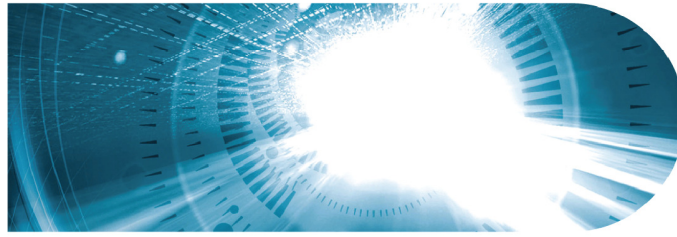
In order to prevent any mishandling, misuse, neglect or accident, it is highly recommended to read and follow the instructions detailed in the application note:

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

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## ORDERING INFORMATION

1943RAM pump product family

Operating Power	Operating wavelength (see Wavelength table)	3SP Part Number
360mW	##	3CN01749##
400mW	##	3CN01560##

## refers to wavelength table below.

3SP Technologies can also develop custom products to meet a wide range of technical requirements. Other wavelength can be offered upon request. Please contact our Sales Manager for details.

## CONTACT INFORMATION

Europe & Asia: +33 (0) 169 805 833  
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+1 888 922 1044  
sales@3spgroup.com  
www.3sptechnologies.com

## IMPORTANT NOTICE

Information in this document is typical and must be specifically confirmed in writing by your supplier before it becomes applicable to any order or contract.

Information is subject to change without notice.

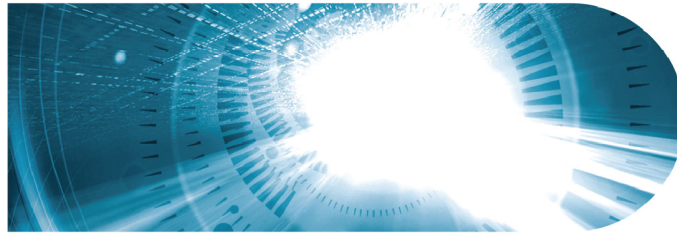
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## WAVELENGTH TABLE

Lambda (nm)	##
1420,00	CY
1421,00	DA
1422,00	DC
1423,00	DE
1424,00	DG
1425,00	DJ
1426,00	DL
1427,00	DN
1428,00	DQ
1429,00	DS
1430,00	DU
1431,00	DW
1432,00	DY
1433,00	EA
1434,00	EC
1435,00	EE
1436,00	EG
1437,00	EJ
1438,00	EL
1439,00	EN
1440,00	EQ
1441,00	ES
1442,00	EU
1443,00	EW
1444,00	EY
1445,00	FA
1446,00	FC
1447,00	FE
1448,00	FG
1449,00	FJ
1450,00	FL
1451,00	FN
1452,00	FQ
1453,00	FS
1454,00	FU
1455,00	FW
1456,00	FY
1457,00	GA
1458,00	GC

Lambda (nm)	##
1459,00	GE
1460,00	GG
1461,00	GJ
1462,00	GL
1463,00	GN
1464,00	GQ
1465,00	GS
1466,00	GU
1467,00	GW
1468,00	GY
1469,00	HA
1470,00	HC
1471,00	HE
1472,00	HG
1473,00	HJ
1474,00	HL
1475,00	HN
1476,00	HQ
1477,00	HS
1478,00	HU
1479,00	HW
1480,00	HY
1481,00	JA
1482,00	JC
1483,00	JE
1484,00	JG
1485,00	JJ
1486,00	JL
1487,00	JN
1488,00	JQ
1489,00	JS
1490,00	JU
1491,00	JW
1492,00	JY
1493,00	KA
1494,00	KC
1495,00	KE
1496,00	KG
1497,00	KJ
1498,00	KL
1499,00	KN
1500,00	KQ