PRELIMINARY DATA SHEET

CEL

RECEIVER
NR4210 Series

InAlAs APD RECEIVER WITH INTERNAL PRE-AMPLIFIER FOR 10 Gb/s APPLICATIONS

DESCRIPTION

The NR4210 Series products consist of InAlAs-APD (avalanche photo diode) ROSAs (Receiver Optical Sub-Assembly) with internal pre-amplifiers designed for 10 Gb/s long-reach optical transceivers such as the XENPAK/X2/XFP. These modules are ideal as receivers for IEEE 10G BASE and SONET OC-192 systems.

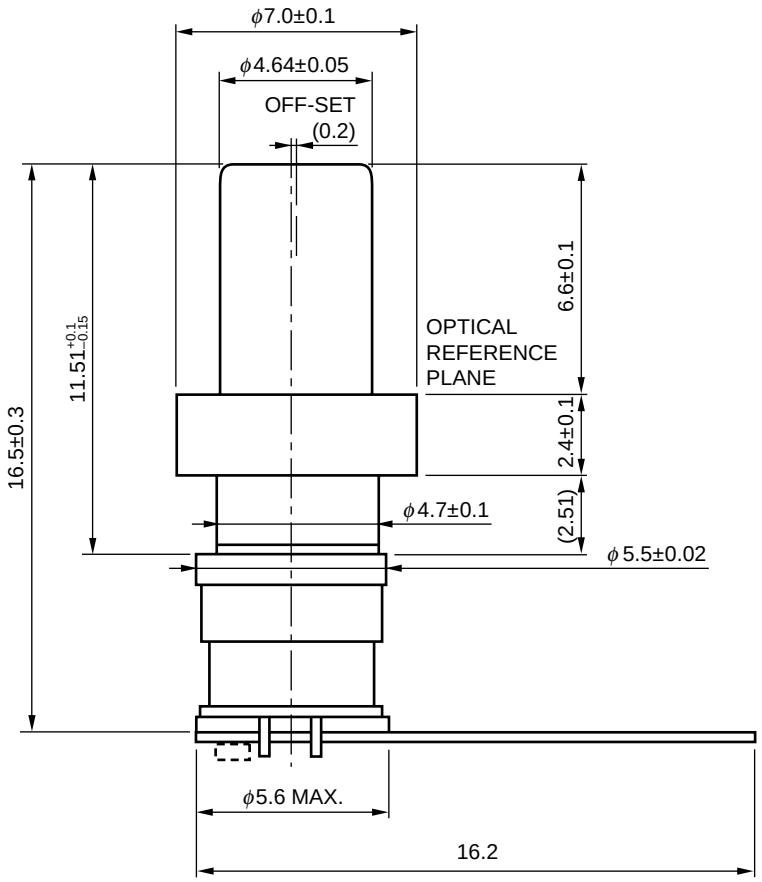
FEATURES

- XMD-MSA compliant ROSA
- 10 Gb/s high sensitivity InAlAs-APD
- +3.3 V SiGe transimpedance pre-amplifier
- Minimum receiver sensitivity $\overline{P_r}$ = –28 dBm
- Operating case temperature T_C = –5 to +85°C
- Transimpedance Z_t = 2 000 Ω (Single-ended)
- Cut-off frequency fc = 8 GHz
- With flexible printed circuit

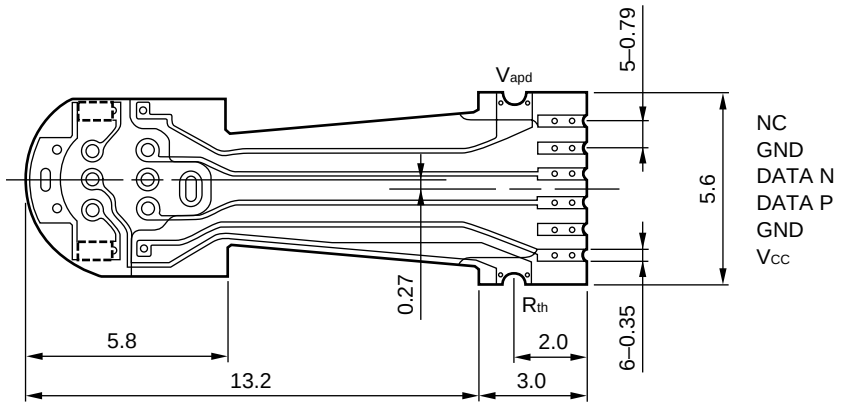
Document No. PL10637EJ01V0DS (1st edition)
Date Published September 2006 NS CP(K)

PACKAGE DIMENSIONS (UNIT: mm)

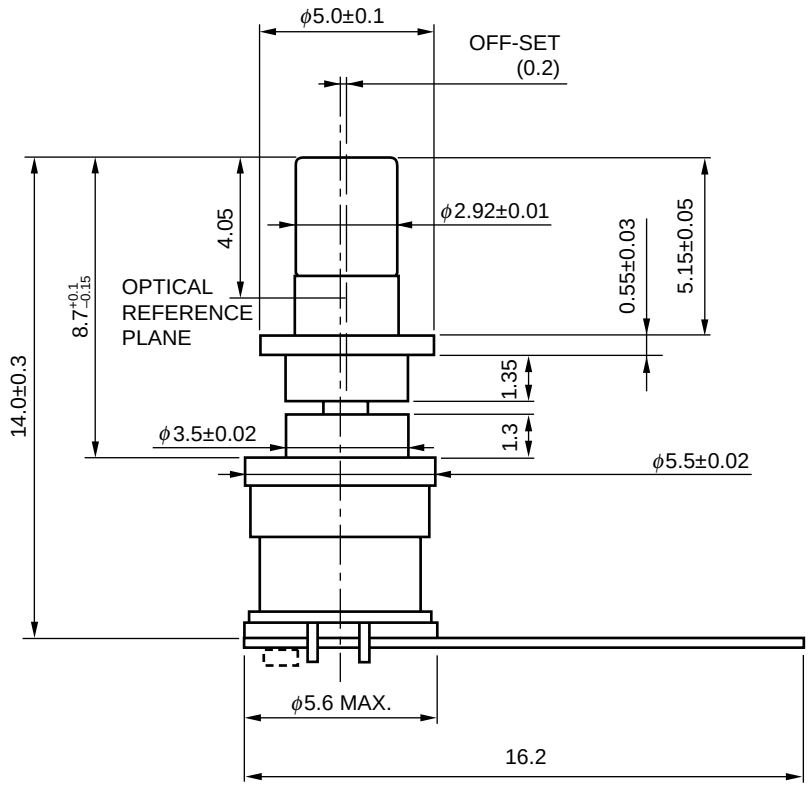
NR4210TF



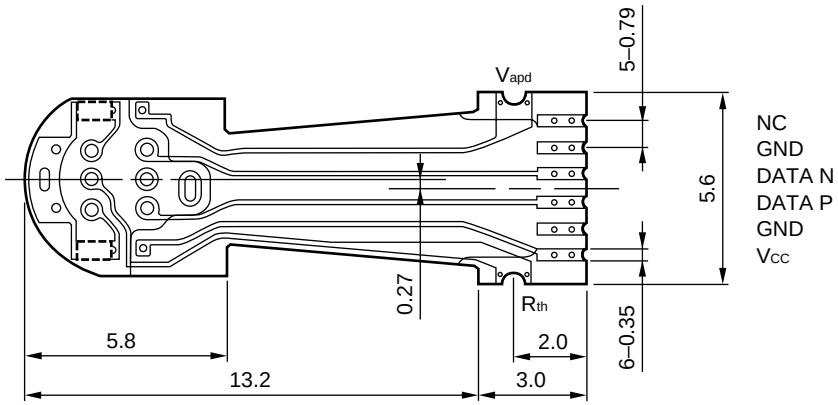
BOTTOM VIEW



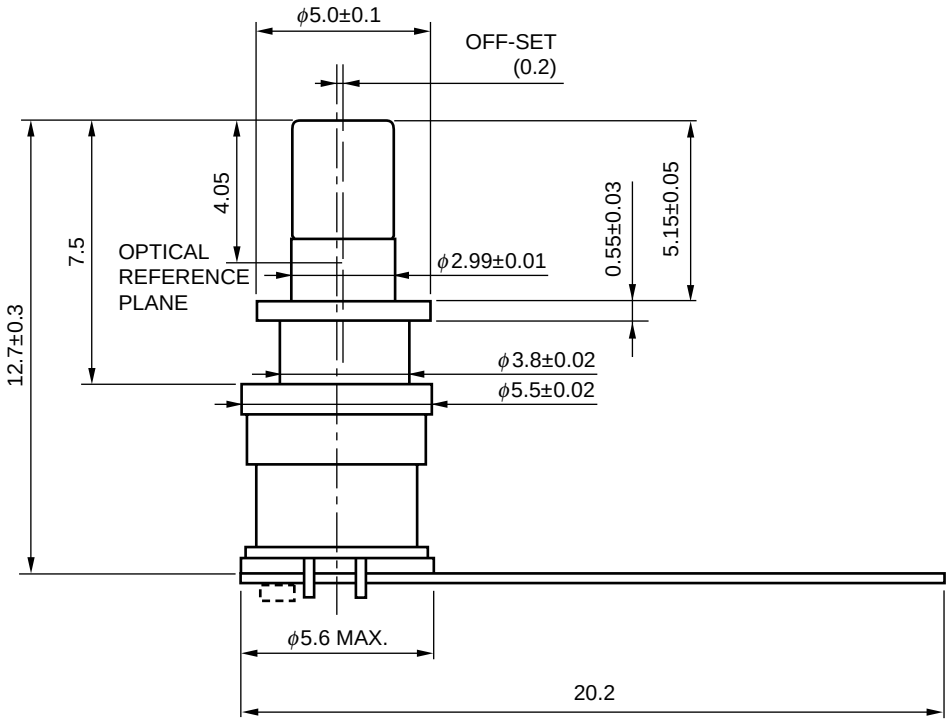
NR4210TG



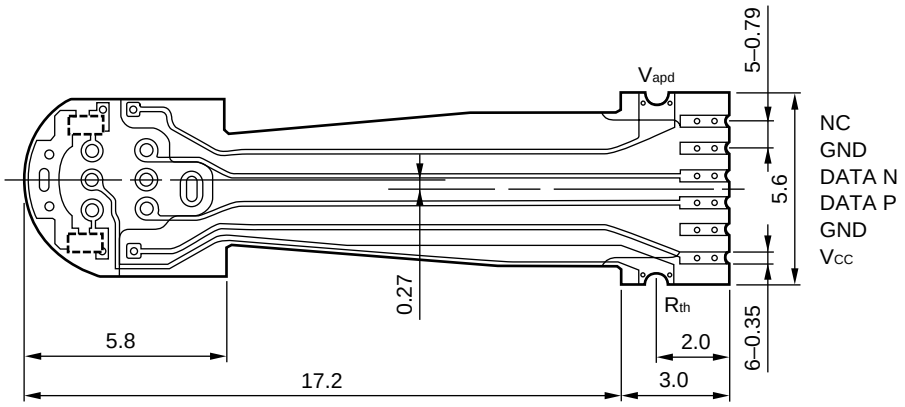
BOTTOM VIEW



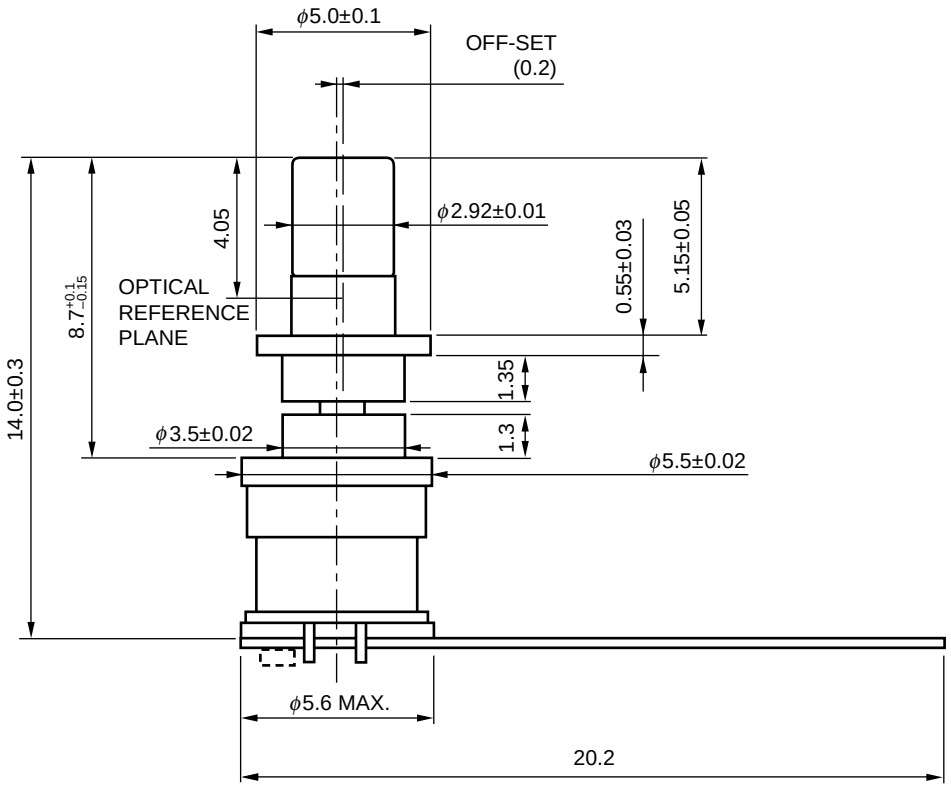
NR4210TK



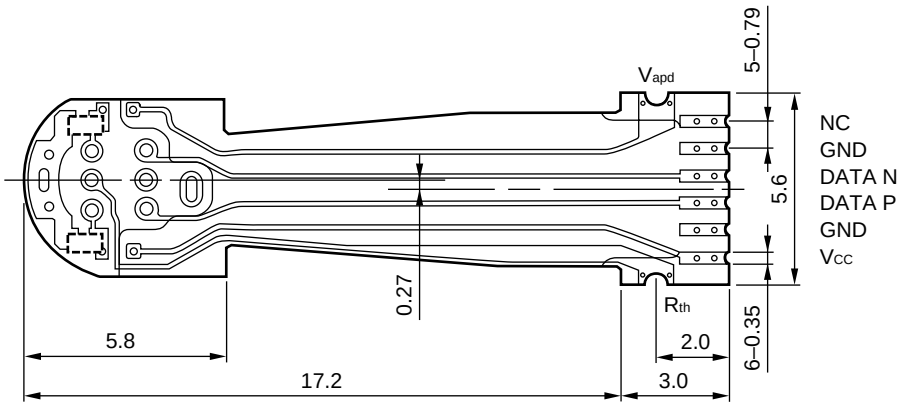
BOTTOM VIEW



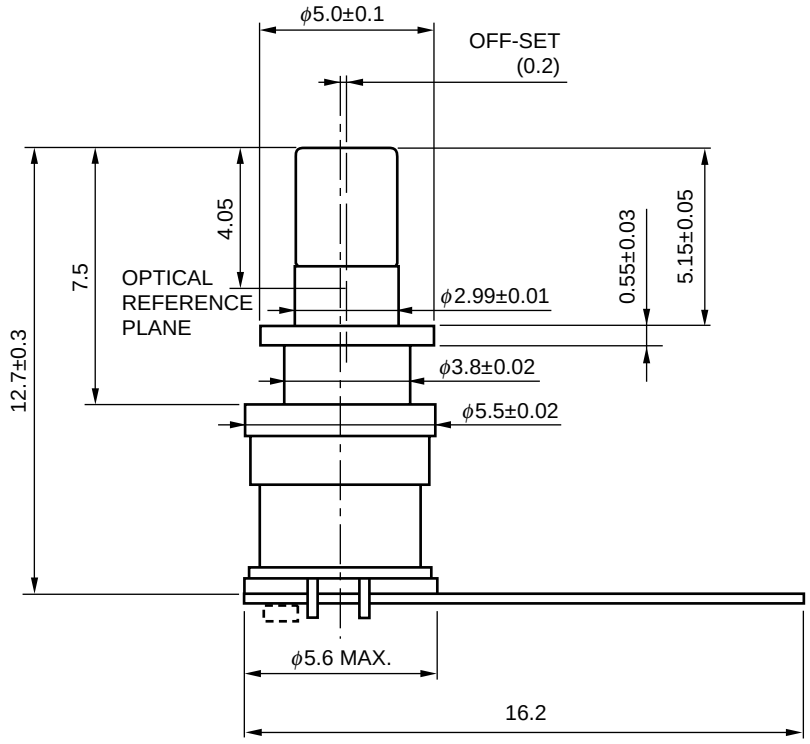
NR4210TL



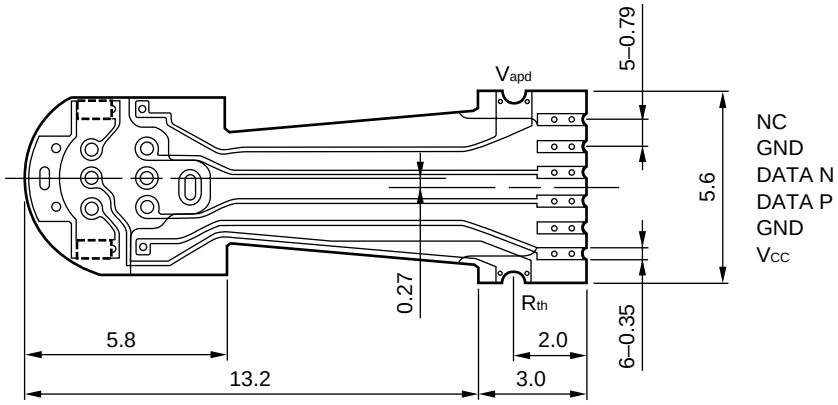
BOTTOM VIEW



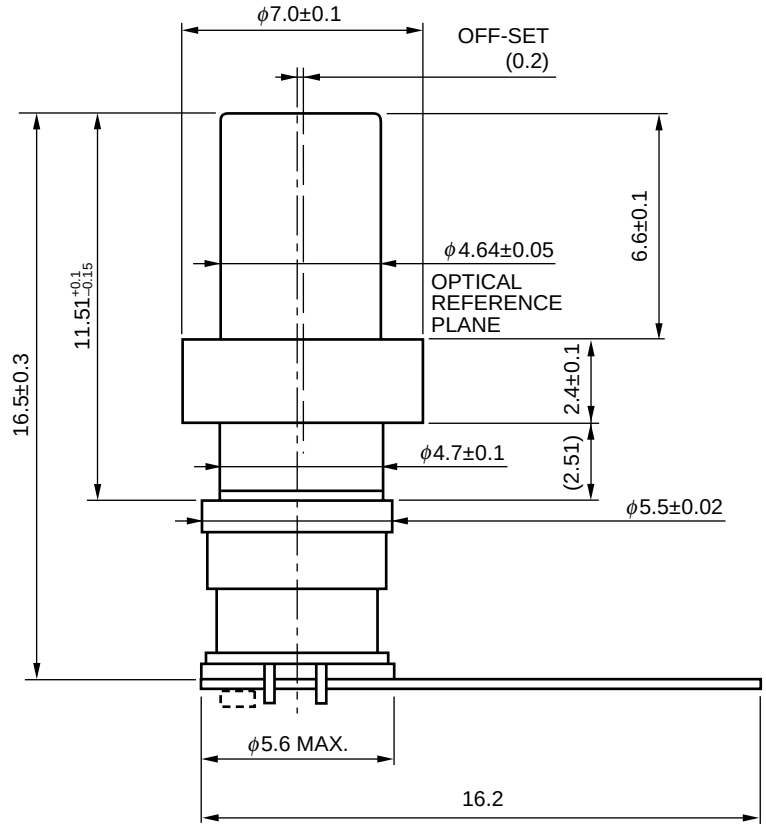
NR4210TP



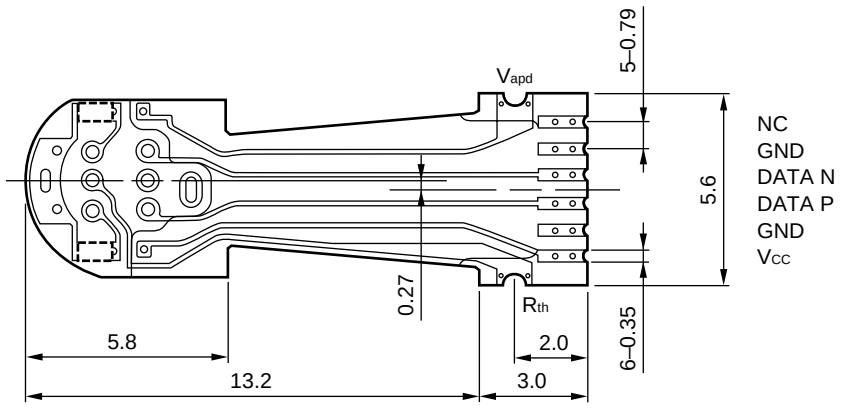
BOTTOM VIEW



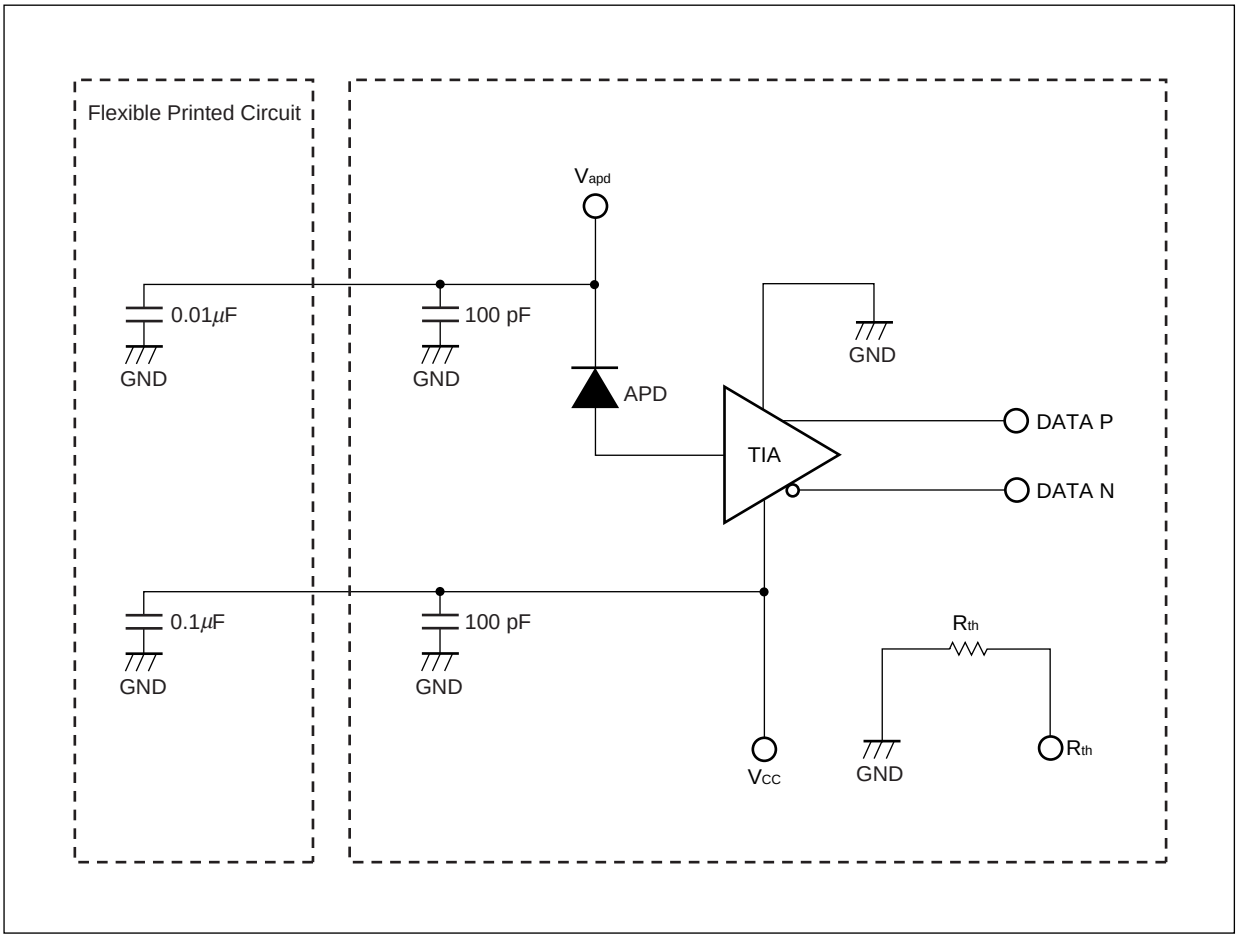
NR4210TX



BOTTOM VIEW



BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Receptacle Type	Flexible PCB Type
NR4210TF-AZ	SC, Zirconia	Standard
NR4210TG-AZ	LC, Electrically Isolated	Standard
NR4210TK-AZ	LC, Zirconia	Long
NR4210TL-AZ	LC, Electrically Isolated	Long
NR4210TP-AZ	LC, Zirconia	Standard
NR4210TX-AZ	SC, Metal	Standard

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
APD Reverse Voltage	V_R	V_{BR}	V
APD Reverse Current	$I_{R\ (peak)}$	4	mA
IC Supply Voltage	V_{CC}	0 to +4	V
Operating Case Temperature	T_C	−5 to +85	°C
Storage Temperature	T_{stg}	−40 to +85	°C
Lead Soldering Temperature (Flexible Printed Circuit)	T_{sld}	350 (3 sec.)	°C

ELECTRO-OPTICAL CHARACTERISTICS (T_C = –5 to +85°C, V_{CC} = +3.3 V, λ = 1 550 nm, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
APD Sensitivity	S	λ = 1 310 nm, M = 1	0.75	0.9		A/W
		λ = 1 550 nm, M = 1	0.75	0.9		
APD Breakdown Voltage	V_{BR}	I_D = 10 μA	25	30	35	V
Temperature Coefficient of APD Breakdown Voltage	δ *1	T_C = +25 to +85°C	0	0.02	0.05	V/°C
APD Dark Current	I_D	$V_R = V_{BR} \times 0.9$, T_C = +25°C			0.7	μA
Transimpedance	Z_t	Single-ended	800	2 000	3 000	Ω
Maximum Output Voltage Swing	V_{clip}	Single-ended	100	125	200	mV_{pp}
Cut-off Frequency	f_C	M = 3, P_{in} = –24 dBm		9		GHz
		M = 9, P_{in} = –24 dBm	7	8		
Lower Cut-off Frequency	f_{cl}				100	kHz
Peaking	D_{PK}	1G–BW, M = 9, P_{in} = –24 dBm			2	dB
Group Delay	GD	1G–6G, M = 9, P_{in} = –24 dBm	–50		+50	ps
Minimum Receiver Sensitivity	$\overline{P_r}$	9.95 Gb/s, BER = 10^{-12}, M_{opt}, PRBS = 2^{31}–1, ER = 13 dB, NRZ		–28	–26.5	dBm
Overload	P_O	9.95 Gb/s, BER = 10^{-12}, M = 3, PRBS = 2^{31}–1, ER = 13 dB, NRZ	–5			dBm
RF Output Return Loss	S_{22}	1G–6G, M = 9, Single-ended			–6	dB
IC Supply Current	I_{CC}		40	55	75	mA
IC Supply Voltage	V_{CC}		+3.1	+3.3	+3.5	V
Optical Return Loss	ORL	λ = 1 310 nm			–27	dB
		λ = 1 550 nm			–27	
Thermistor Resistance	R_{th}		9.5	10	10.5	kΩ
Thermistor B Constant	B		3 350	3 450	3 550	K

***1** $\delta = \dfrac{\Delta V_{BR}}{\Delta T_C}$

REFERENCE

Document Name	Document No.
Opto-Electronics Devices Pamphlet *1	PX10160E

***1** Published by the former NEC Compound Semiconductor Devices, Ltd.

- **The information in this document is current as of September, 2006. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".
  The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.
  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.
  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).
  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)
(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02. 11-1

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.
Caution Optical Fiber	A glass-fiber is attached on the product. Handle with care. • When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.

▶**For further information, please contact**

NEC Compound Semiconductor Devices Hong Kong Limited
E-mail: contact@ncsd-hk.necel.com
Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309
Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859
Korea Branch Office TEL: +82-2-558-2120 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH http://www.eu.necel.com/
TEL: +49-211-6503-0 FAX: +49-211-6503-1327

California Eastern Laboratories, Inc. http://www.cel.com/
TEL: +1-408-988-3500 FAX: +1-408-988-0279

Compound Semiconductor Devices Division
NEC Electronics Corporation
URL: http://www.ncsd.necel.com/

0604

CEL California Eastern Laboratories

4590 Patrick Henry Drive
Santa Clara, CA 95054-1817
Telephone: (408) 919-2500
Facsimile: (408) 988-0279

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
Lead (Pb)	< 1000 PPM	-A	-AZ
		Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.