RENESAS

DATA SHEET

PHOTO DIODE

NR8300FP-CC

1 000 to 1 600 nm OPTICAL FIBER COMMUNICATIONS
ϕ 30 μm InGaAs AVALANCHE PHOTO DIODE MODULE

DESCRIPTION

The NR8300FP-CC is an InGaAs avalanche photo diode module with single mode fiber, and can be used in OTDR systems.

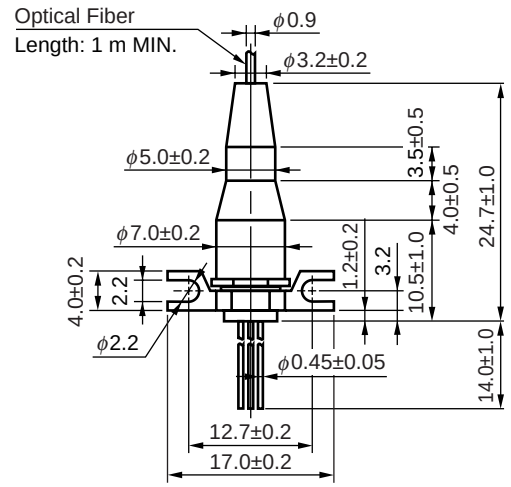
FEATURES

- Small dark current I_D = 5 nA
- Small terminal capacitance C_t = 0.35 pF @ 0.9 $V_{(BR)R}$
- High quantum efficiency η = 90% @ λ = 1 310 nm, M = 1
  η = 77% @ λ = 1 550 nm, M = 1
- High speed response f_C = 2.5 GHz @ M = 10
- Detecting area size ϕ 30 μm
- Coaxial module with single mode fiber (SM-9/125)

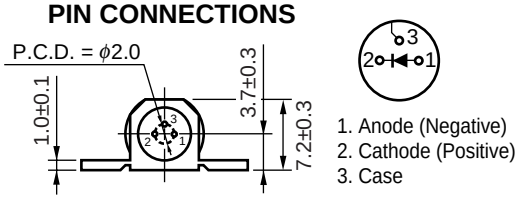
Document No. PL10116EJ01V0DS (1st edition)
Date Published March 2002 CP(K)
Printed in Japan

PACKAGE DIMENSIONS (UNIT: mm)

NR8300FP-CC



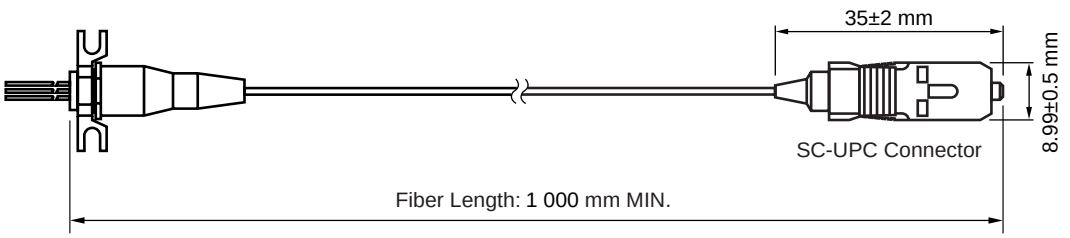
PIN CONNECTIONS



1. Anode (Negative)
2. Cathode (Positive)
3. Case

OPTICAL FIBER CHARACTERISTICS

Parameter	Specification	Unit
Mode Field Diameter	9.5±1	μm
Core Diameter	–	μm
Cladding Diameter	125±2	μm
Maximum Cladding Noncircularity	2	%
Maximum Core/Cladding Concentricity	1.6	%
Outer Diameter	0.9±0.1	mm
Cut-off Wavelength	1 100 to 1 270	nm
Minimum Fiber Bending Radius	30	mm
Fiber Length	1 000 MIN.	mm
Flammability	UL1581 VW-1	



ORDERING INFORMATION

Part Number	Flange Type	Fiber Type	Available Connector
NR8300FP-CC	Flat Mount Flange	SMF	With SC-UPC Connector

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Forward Current	I_F	10	mA
Reverse Current	I_R	0.5	mA
Operating Case Temperature	T_C	–40 to +85	°C
Storage Temperature	T_{stg}	–40 to +85	°C
Lead Soldering Temperature	T_{sld}	260 (10 sec.)	°C
Relative Humidity (noncondensing)	RH	85	%

ELECTRO-OPTICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

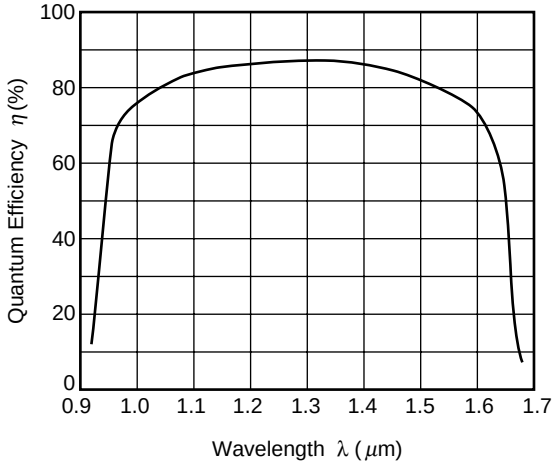
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Reverse Breakdown Voltage	V_{BR}	I_D = 100 μA	50	70	100	V
Temperature Coefficient of Reverse Breakdown Voltage	δ *1			0.2		%/°C
Dark Current	I_D	$V_R = V_{BR} \times 0.9$		5	25	nA
Multiplied Dark Current	I_{DM}	M = 2 to 10		1	5	nA
Terminal Capacitance	C_t	$V_R = V_{BR} \times 0.9$, f = 1 MHz		0.35	0.60	pF
Cut-off Frequency	f_C	M = 10	2.5			GHz
Sensitivity	S	λ = 1 310 nm, M = 1	0.8	0.94		A/W
		λ = 1 550 nm, M = 1	0.81	0.96		
Multiplication Factor	M	λ = 1 310 nm, I_{po} = 1.0 μA, V_R = V (@ I_D = 1 μA)	30	40		
Excess Noise Factor*2	x	λ = 1 310 nm, 1 550 nm, I_{po} = 1.0 μA,		0.7		
	F	M = 10, f = 35 MHz, B = 1 MHz		5		
Optical Return Loss	ORL	SMF	30			dB

***1** $\delta = \dfrac{V_{BR}(25°C + \Delta T°C) - V_{BR}(25°C)}{\Delta T°C \cdot V_{BR}(25°C)}$

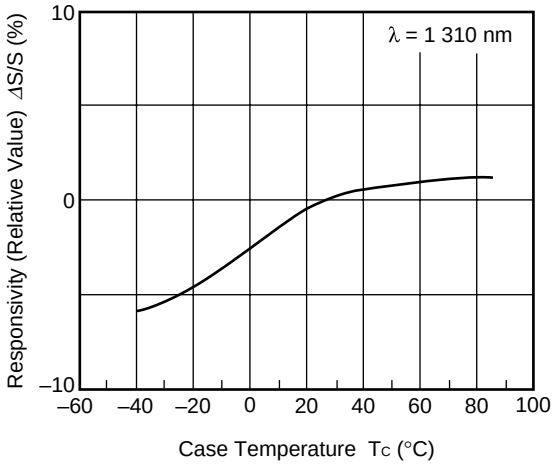
***2** $F = M^x$

TYPICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

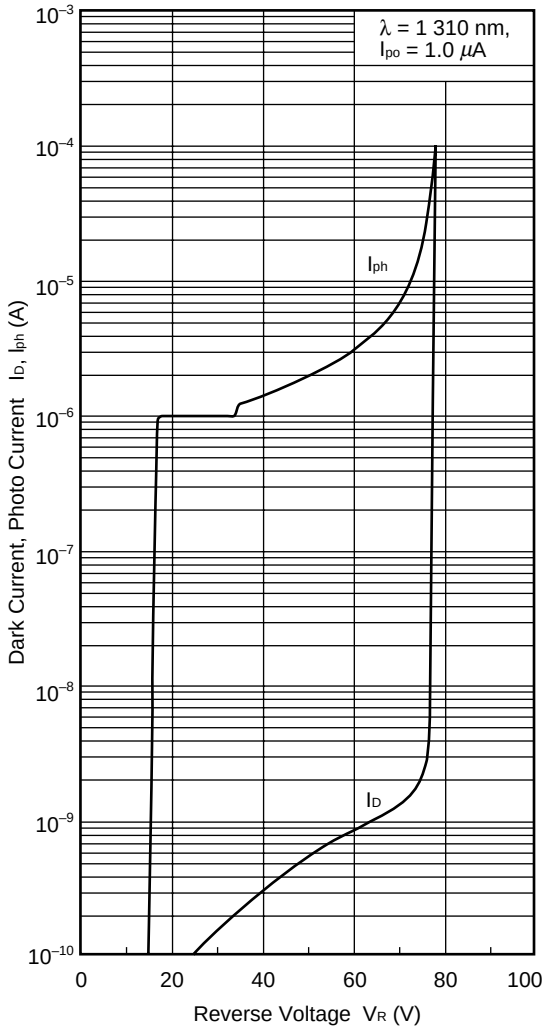
WAVELENGTH DEPENDENCE OF QUANTUM EFFICIENCY



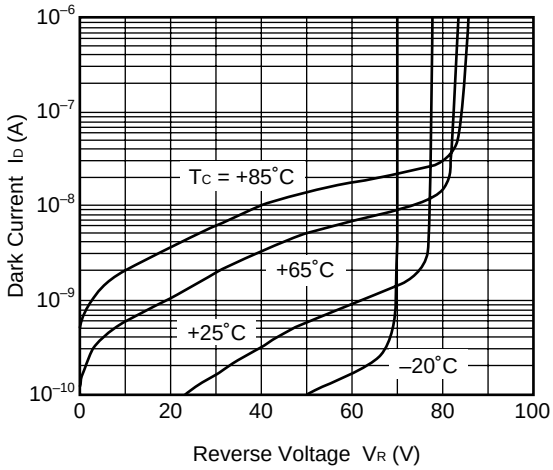
TEMPERATURE DEPENDENCE OF RESPONSIVITY



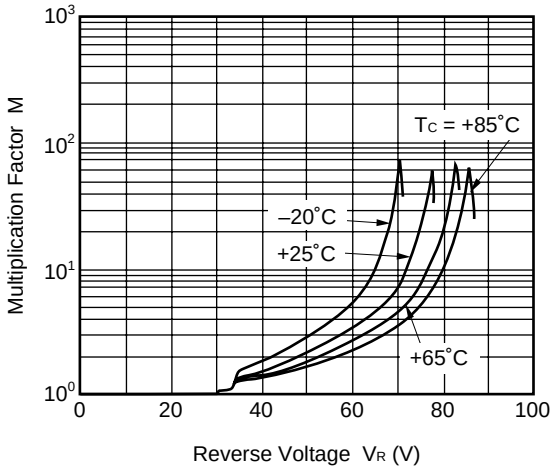
DARK CURRENT AND PHOTO CURRENT vs. REVERSE VOLTAGE



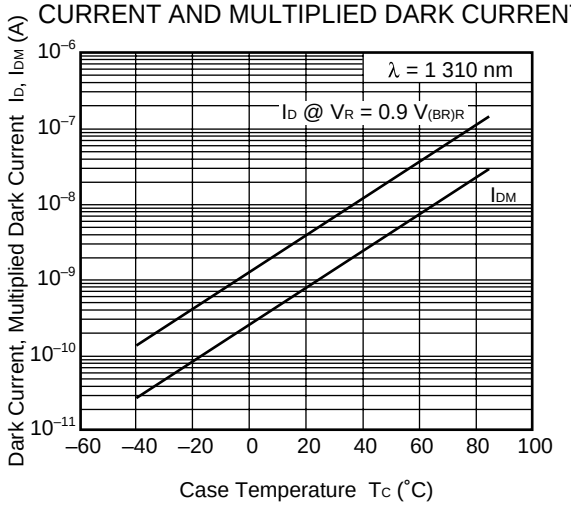
DARK CURRENT vs. REVERSE VOLTAGE



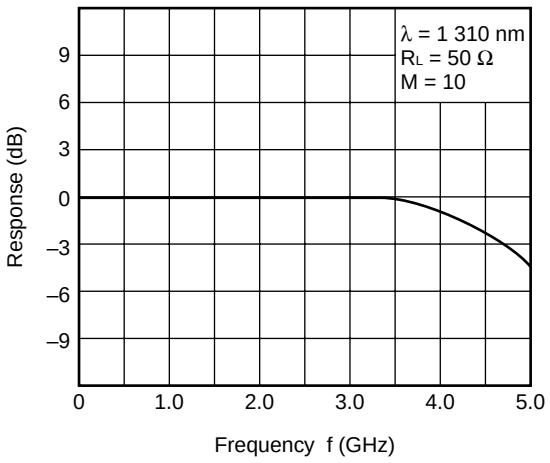
MULTIPLICATION FACTOR vs. REVERSE VOLTAGE



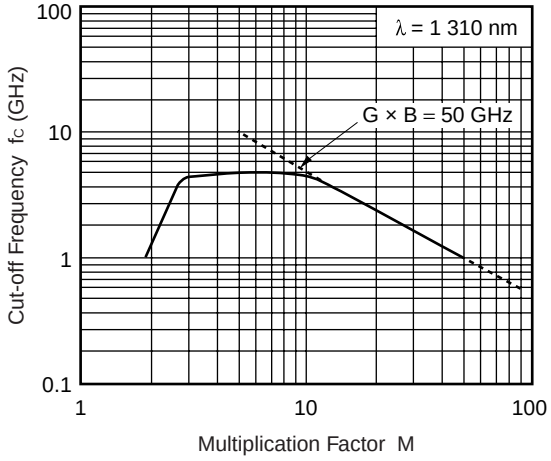
TEMPERATURE DEPENDENCE OF DARK CURRENT AND MULTIPLIED DARK CURRENT



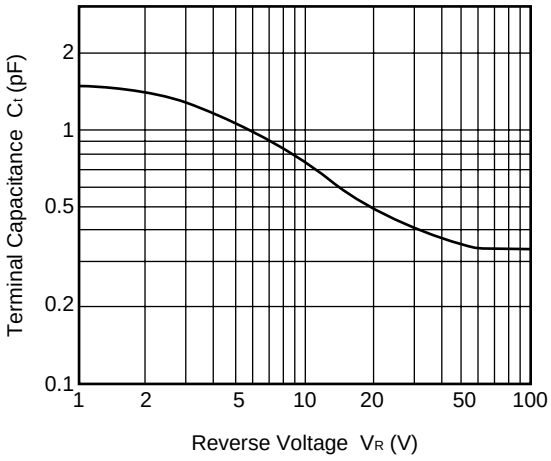
FREQUENCY RESPONSE



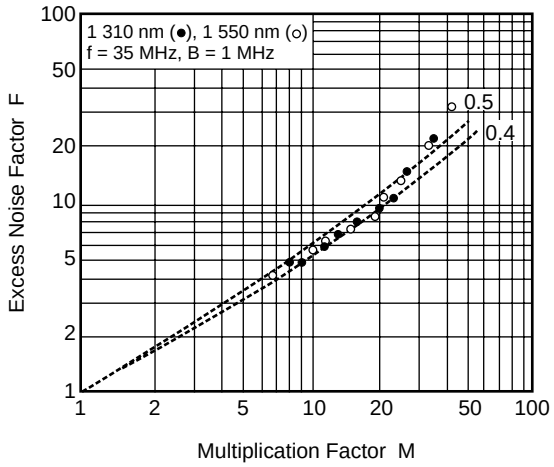
CUT-OFF FREQUENCY vs. MULTIPLICATION FACTOR



TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



EXCESS NOISE FACTOR vs. MULTIPLICATION FACTOR



Remark The graphs indicate nominal characteristics.

REFERENCE

Document Name	Document No.
Optical semiconducrtor devices for fiberoptic communications Selection Guide	P12480E
Opto-Electronics Devices Pamphlet	P13623E
Opto-Electronics Devices (CD-ROM)	P12944X
NEC semiconductor device reliability/quality control system[*1]	C11159E
Quality grades on NEC semiconductor devices[*1]	C11531E
SEMICONDUCTOR SELECTION GUIDE –Products and Packages–[*1]	X13769E

***1** Published by NEC Corporation

- **The information in this document is current as of March, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC 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 prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC 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 semiconductor 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 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 customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor 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 semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor 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 semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

  (Note)

  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.
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.

▶Business issue

NEC Compound Semiconductor Devices, Ltd.
5th Sales Group, Sales Division TEL: +81-3-3798-6372 FAX: +81-3-3798-6783 E-mail: salesinfo@csd-nec.com

NEC Compound Semiconductor Devices Hong Kong Limited
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: +82-2-528-0301 FAX: +82-2-528-0302

NEC Electron Devices European Operations http://www.nec.de/
TEL: +49-211-6503-101 FAX: +49-211-6503-487

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

▶Technical issue

NEC Compound Semiconductor Devices, Ltd. http://www.csd-nec.com/
Sales Engineering Group, Sales Division
E-mail: techinfo@csd-nec.com FAX: +81-44-435-1918