

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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**1 000 to 1 600 nm OPTICAL FIBER COMMUNICATIONS  
 $\phi$  30  $\mu$ m InGaAs AVALANCHE PHOTO DIODE MODULE**

**DESCRIPTION**

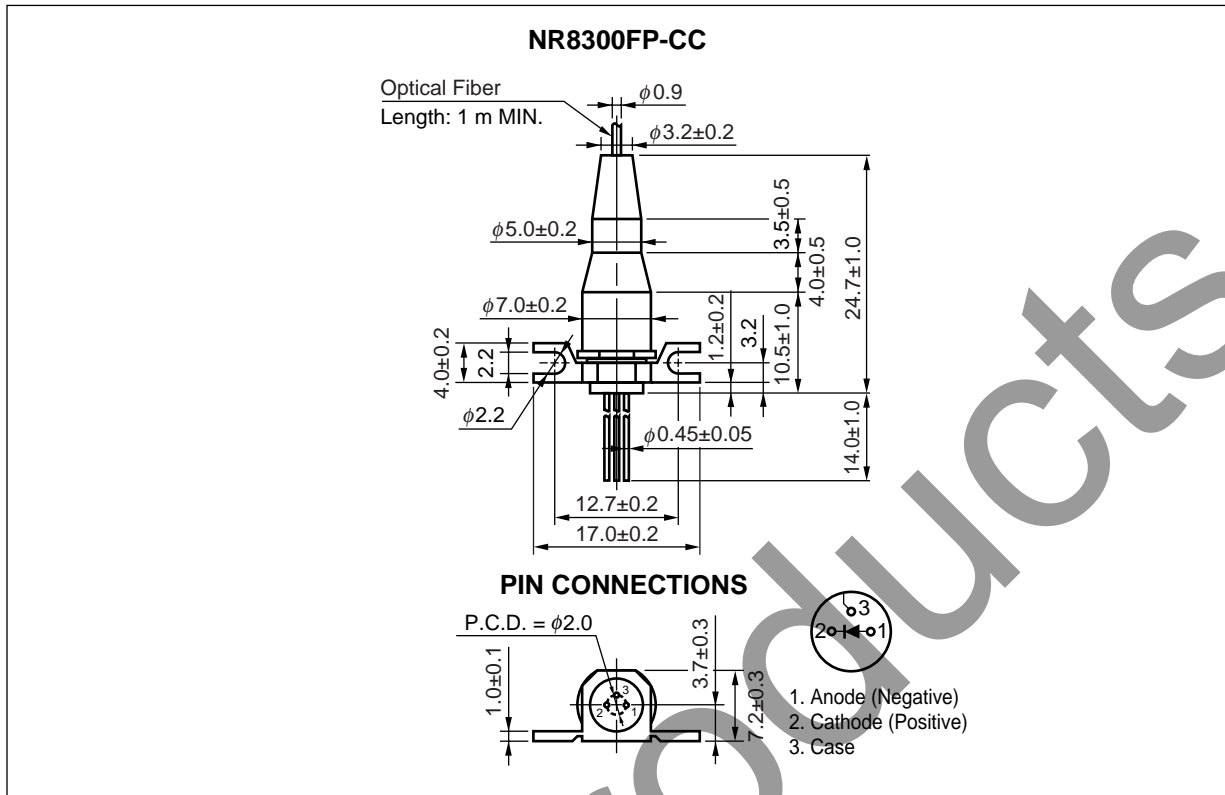
The NR8300FP-CC is an InGaAs avalanche photo diode module with single mode fiber, and can be used in OTDR systems.

**FEATURES**

- Small dark current  $I_D = 5$  nA
- Small terminal capacitance  $C_t = 0.35$  pF @ 0.9 V<sub>(BR)R</sub>
- High quantum efficiency  $\eta = 90\%$  @  $\lambda = 1\ 310$  nm, M = 1  
 $\eta = 77\%$  @  $\lambda = 1\ 550$  nm, M = 1
- High speed response  $f_c = 2.5$  GHz @ M = 10
- Detecting area size  $\phi$  30  $\mu$ m
- Coaxial module with single mode fiber (SM-9/125)

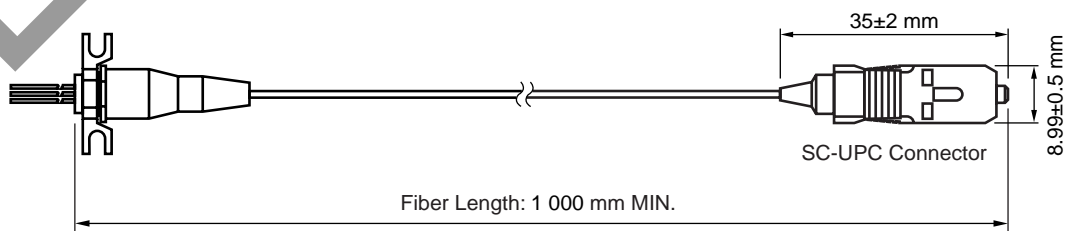
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 Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

PACKAGE DIMENSIONS (UNIT: mm)



OPTICAL FIBER CHARACTERISTICS

Parameter	Specification	Unit
Mode Field Diameter	$9.5 \pm 1$	$\mu\text{m}$
Core Diameter		$\mu\text{m}$
Cladding Diameter	$125 \pm 2$	$\mu\text{m}$
Maximum Cladding Noncircularity	2	%
Maximum Core/Cladding Concentricity	1.6	%
Outer Diameter	$0.9 \pm 0.1$	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	%

EOL products

**ELECTRO-OPTICAL CHARACTERISTICS (T<sub>c</sub> = 25°C, unless otherwise specified)**

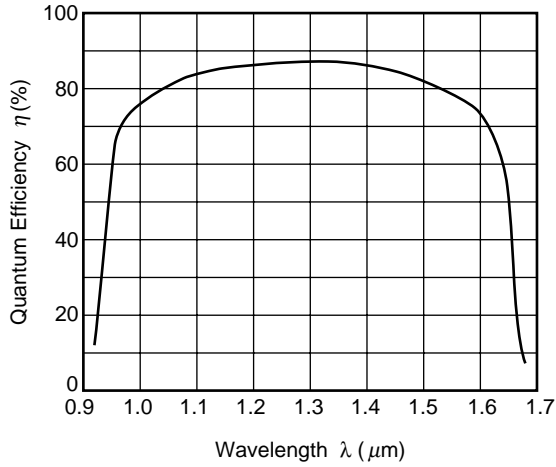
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>D</sub> = 100 μA	50	70	100	V
Temperature Coefficient of Reverse Breakdown Voltage	δ <sup>-1</sup>			0.2		%/°C
Dark Current	I <sub>D</sub>	V <sub>R</sub> = V <sub>BR</sub> × 0.9		5	25	nA
Multiplied Dark Current	I <sub>DM</sub>	M = 2 to 10		1	5	nA
Terminal Capacitance	C <sub>t</sub>	V <sub>R</sub> = V <sub>BR</sub> × 0.9, f = 1 MHz		0.35	0.60	pF
Cut-off Frequency	f <sub>c</sub>	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 <sub>po</sub> = 1.0 μA, V <sub>R</sub> = V (@ I <sub>D</sub> = 1 μA)	30	40		
Excess Noise Factor <sup>*2</sup>	x	λ = 1 310 nm, 1 550 nm, I <sub>po</sub> = 1.0 μA,		0.7		
	F	M = 10, f = 35 MHz, B = 1 MHz		5		
Optical Return Loss	ORL	SMF	30			dB

\*1 
$$\delta = \frac{V_{BR}(25^\circ\text{C} + \Delta T^\circ\text{C}) - V_{BR}(25^\circ\text{C})}{\Delta T^\circ\text{C} \cdot V_{BR}(25^\circ\text{C})}$$

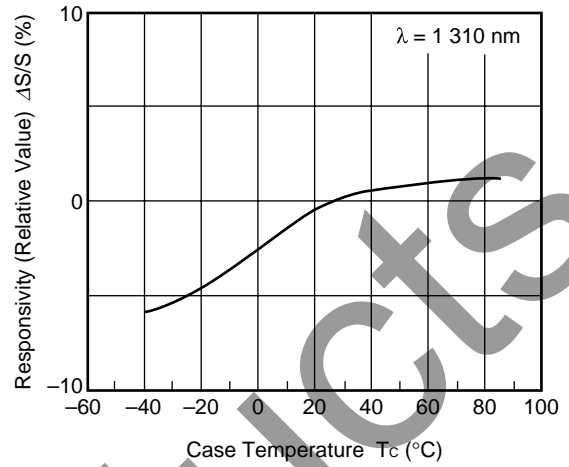
\*2  $F = M^x$

TYPICAL CHARACTERISTICS ( $T_c = 25^\circ\text{C}$ , unless otherwise specified)

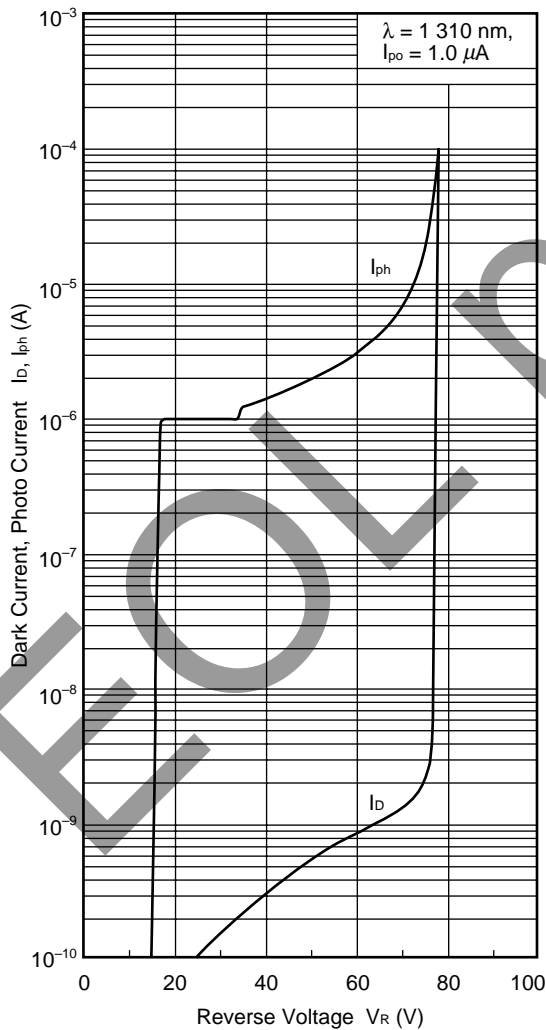
WAVELENGTH DEPENDENCE OF QUANTUM EFFICIENCY



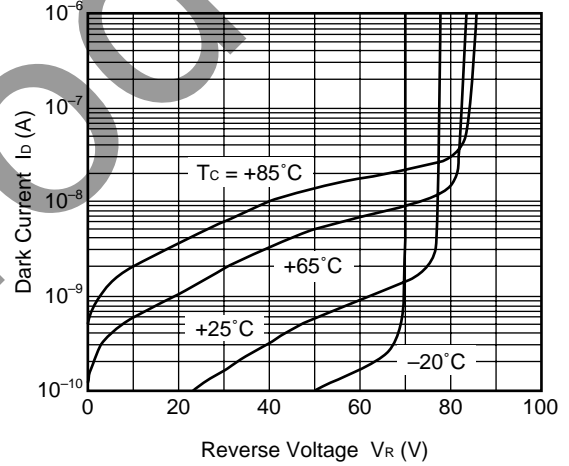
TEMPERATURE DEPENDENCE OF RESPONSIVITY



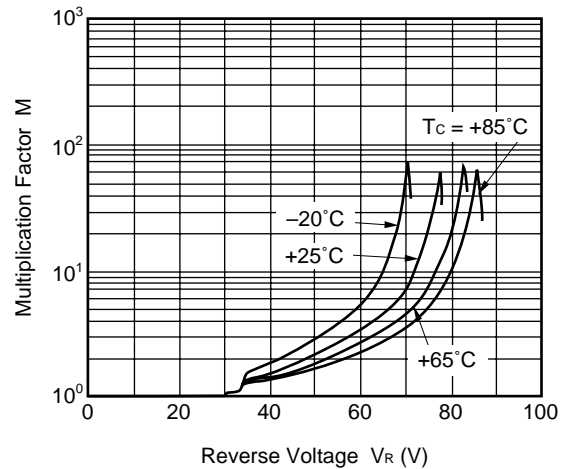
DARK CURRENT AND PHOTO CURRENT vs. REVERSE VOLTAGE



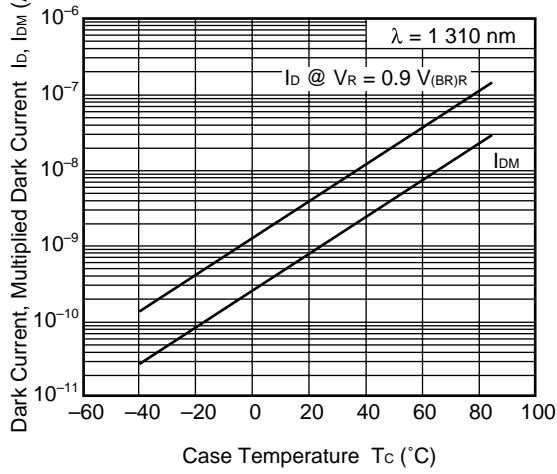
DARK CURRENT vs. REVERSE VOLTAGE



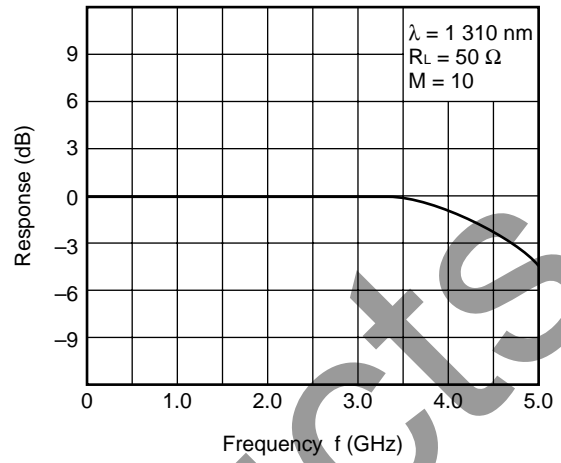
MULTIPLICATION FACTOR vs. REVERSE VOLTAGE



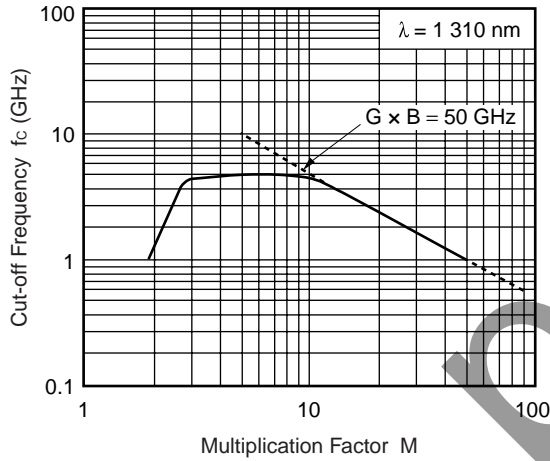
TEMPERATURE DEPENDENCE OF DARK CURRENT AND MULTIPLIED DARK CURRENT



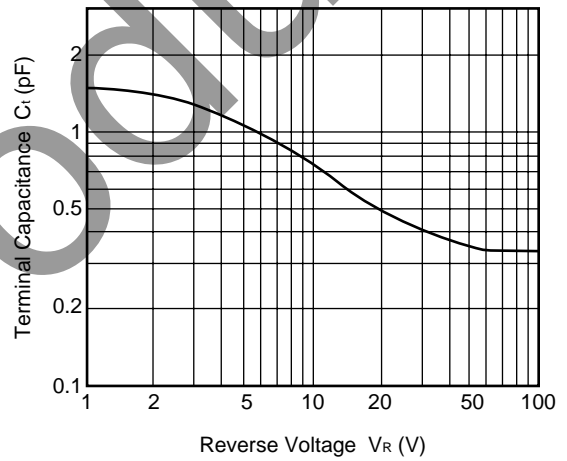
FREQUENCY RESPONSE



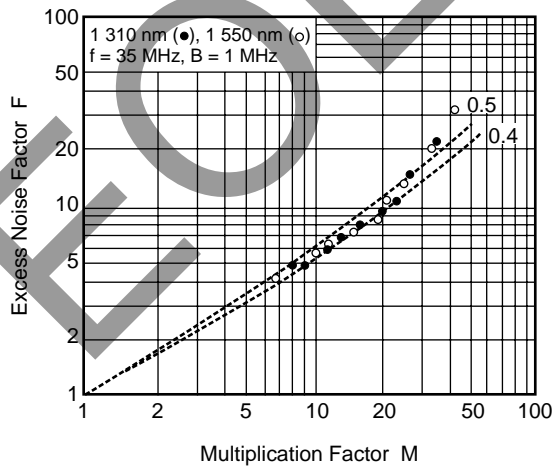
CUT-OFF FREQUENCY vs. MULTIPLICATION FACTOR



TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



EXCESS NOISE FACTOR vs. MULTIPLICATION FACTOR



**Remark** The graphs indicate nominal characteristics.



REFERENCE

Document Name	Document No.
Optical semiconductor 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 <sup>*1</sup>	C11159E
Quality grades on NEC semiconductor devices <sup>*1</sup>	C11531E
SEMICONDUCTOR SELECTION GUIDE –Products and Packages– <sup>*1</sup>	X13769E

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M8E 00.4-0110

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<p><b>Caution</b> GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
<p><b>Caution</b> Optical Fiber</p>	<p>A glass-fiber is attached on the product. Handle with care.</p> <ul style="list-style-type: none"> <li>• When the fiber is broken or damaged, handle carefully to avoid injury from the damaged part or fragments.</li> </ul>

► **Business issue**

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