

To our customers,

Old Company Name in Catalogs and Other Documents

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

April 1st, 2010
Renesas Electronics Corporation

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

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NDL5592P Series

$\phi 30 \mu\text{m}$ InGaAs AVALANCHE PHOTO DIODE MODULE WITH INTERNAL PRE-AMPLIFIER FOR 2.5 Gb/s

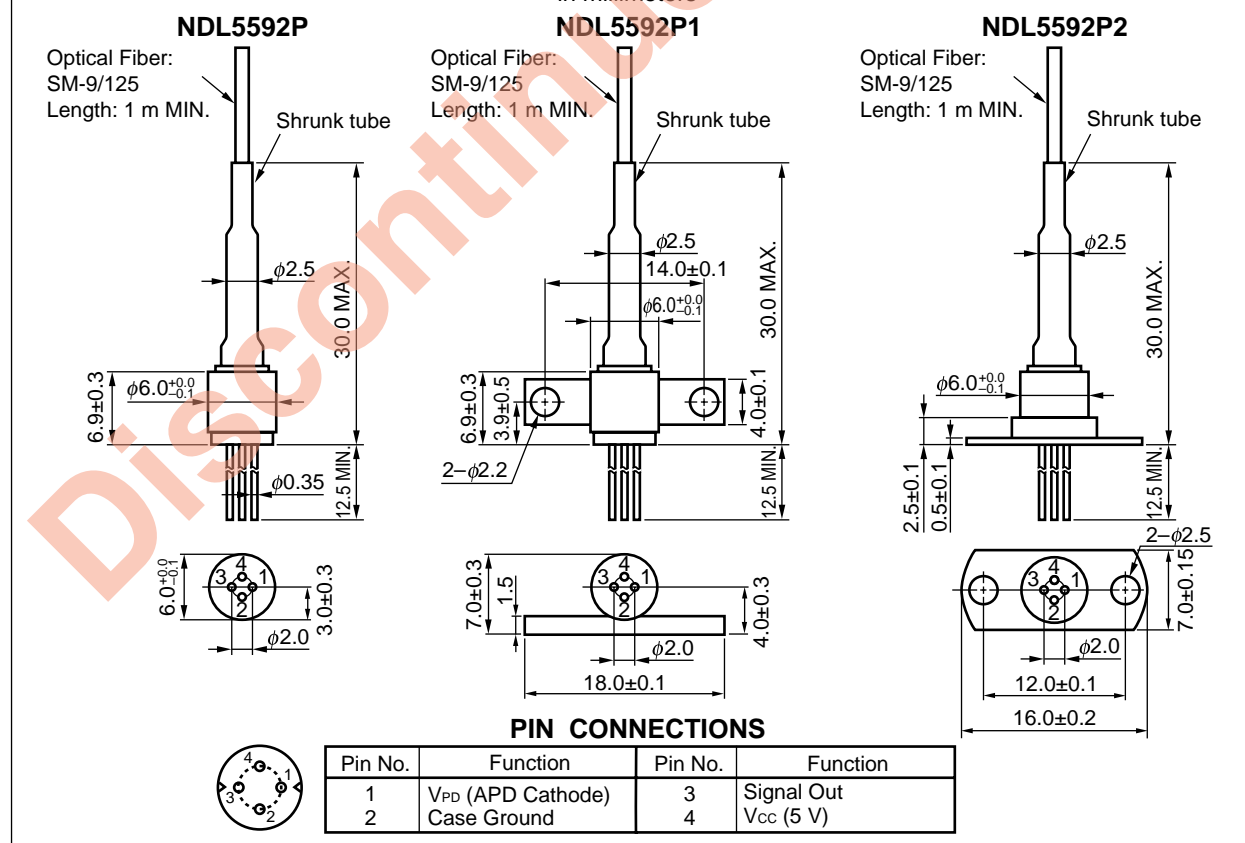
DESCRIPTION

The NDL5592P Series is an InGaAs avalanche photo diode module with single mode fiber incorporating a silicon pre-amplifier IC. It is designed as an optical receiver for fiber optic communications systems such as SDH, SONET, digital video transmission. It is designed for STM-16 applications.

FEATURES

- Internal Si pre-amplifier IC
- High sensitivity $\bar{P} = -33 \text{ dBm TYP. @ } 2.488 \text{ Gb/s, NRZ}$
- Wide dynamic range $D_r = 26 \text{ dB TYP. @ } 2.488 \text{ Gb/s, NRZ}$
- Output impedance 50Ω
- Transimpedance 300Ω
- Detecting area size $\phi 30 \mu\text{m}$
- SM-9/125 single mode fiber pigtail

PACKAGE DIMENSIONS in millimeters



The information in this document is subject to change without notice.

ORDERING INFORMATION

Part Number	Available Connector	Flange Type
NDL5592P	Without Connector	No Flange
NDL5592PC	With FC-PC Connector	
NDL5592PD	With SC-PC Connector	
NDL5592P1	Without Connector	Flat Mount Flange
NDL5592P1C	With FC-PC Connector	
NDL5592P1D	With SC-PC Connector	
NDL5592P2	Without Connector	Vertical Flange
NDL5592P2C	With FC-PC Connector	
NDL5592P2D	With SC-PC Connector	

ABSOLUTE MAXIMUM RATINGS ($T_c = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

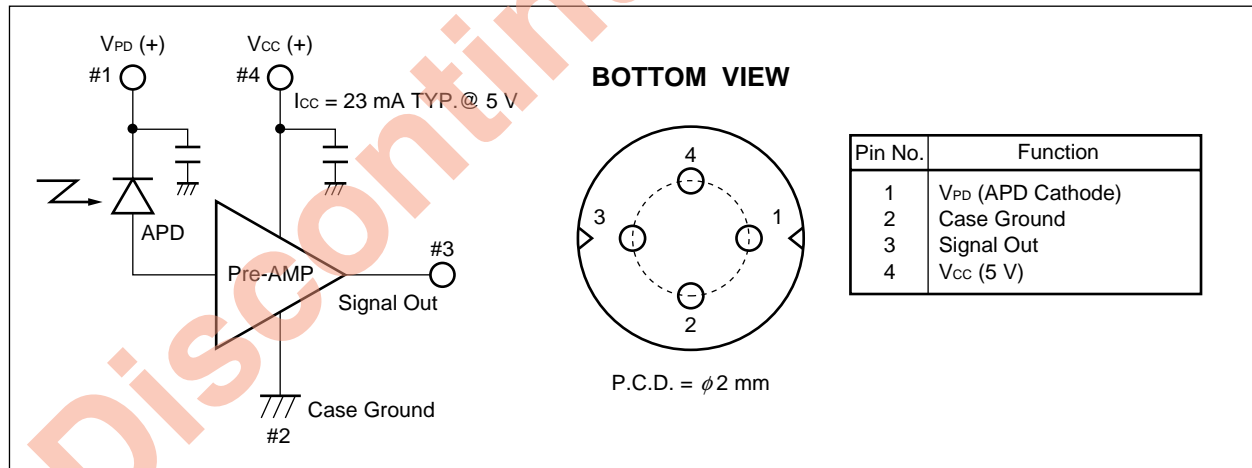
Parameter	Symbol	Ratings	Unit
Reverse Current	I_R	0.5	mA
Supply Voltage	V_{CC}	6.0	V
Operating Case Temperature	T_c	-40 to +85	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40 to +85	$^{\circ}\text{C}$
Lead Soldering Temperature (10 s)	T_{sld}	260	$^{\circ}\text{C}$

ELECTRO-OPTICAL CHARACTERISTICS (T_c = 25 °C)

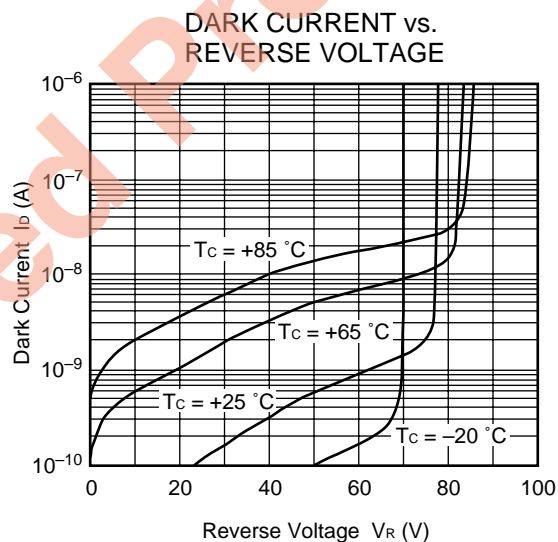
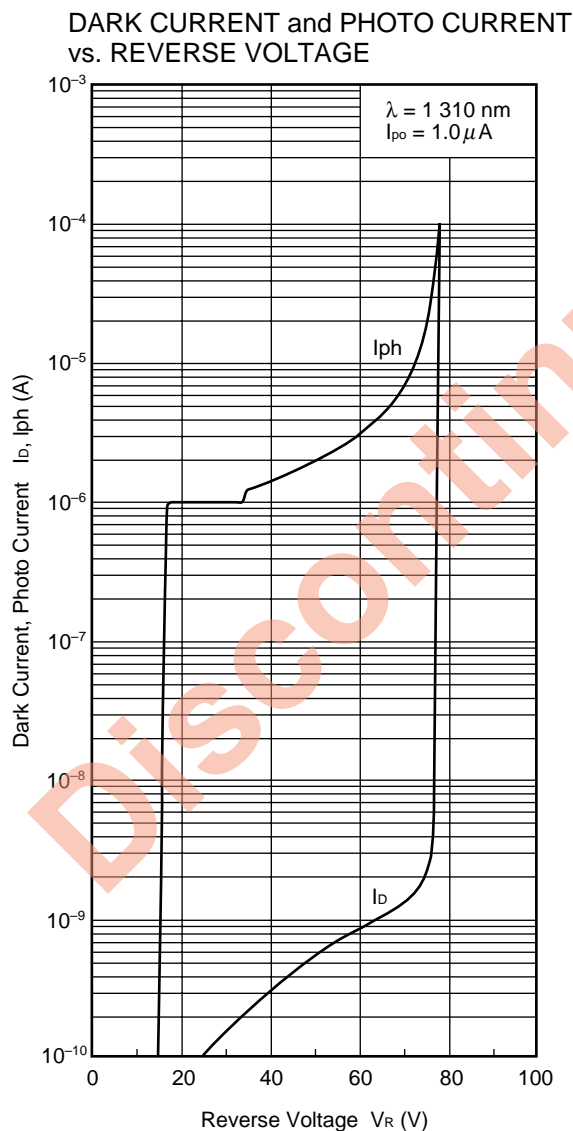
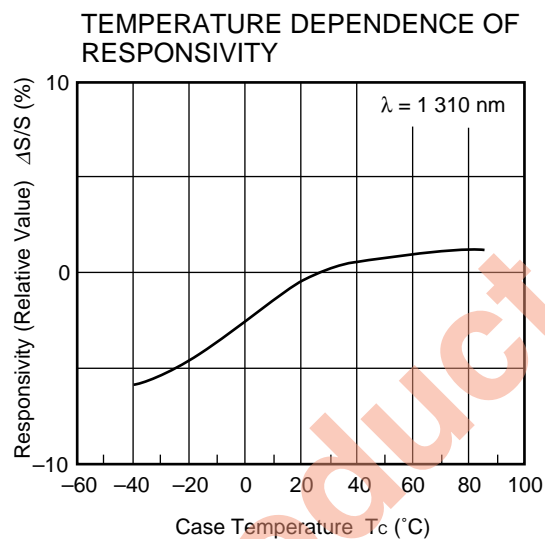
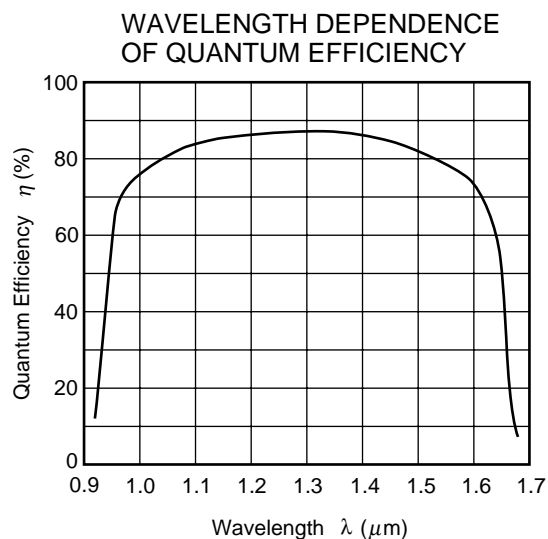
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Reverse Breakdown Voltage	V _{(BR)R}	I _D = 100 μA	50	70	100	V
Temperature Coefficient of Reverse Breakdown Voltage	δ ^{*1}			0.2		%/°C
Dark Current	I _D	V _R = V _{(BR)R} × 0.9		5	25	nA
Receiver Sensitivity	P̄	2.488 Gb/s, NRZ, PN 2 ¹⁵ -1,		-33	-31	dBm
Dynamic Range	D _r	BER = 10 ⁻¹¹ , Mark: 1/2, λ = 1 310 nm	22	26		dB
Quantum Efficiency	η	λ = 1 310 nm, M = 1	76	90		%
		λ = 1 550 nm, M = 1	65	77		
Responsivity	S	λ = 1 310 nm, M = 1	0.80	0.94		A/W
		λ = 1 550 nm, M = 1	0.81	0.96		
Cut-off Frequency	f _c	M = 10, 3 dB down	2.5	4.0		GHz
Equivalent Input Noise Current	I _n	f = 2.5 GHz		9.0		pA/√Hz
Supply Voltage	V _{CC}			5.2		V
Supply Current	I _{CC}	V _{CC} = 5.2 V		23	30	mA
Transimpedance	Z _t			300		Ω
Output Impedance	Z _{out}			50		Ω

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

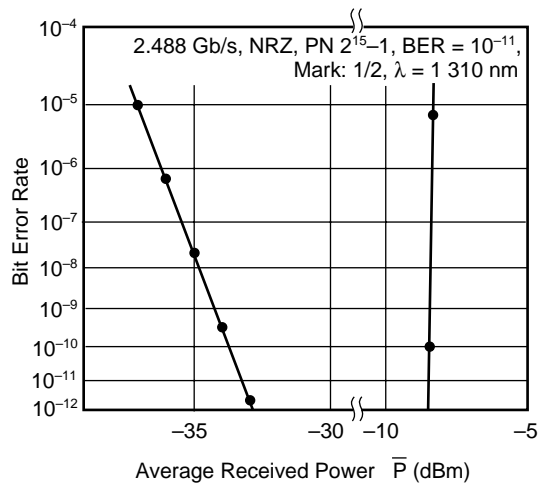
EQUIVALENT CIRCUIT AND PIN CONNECTIONS



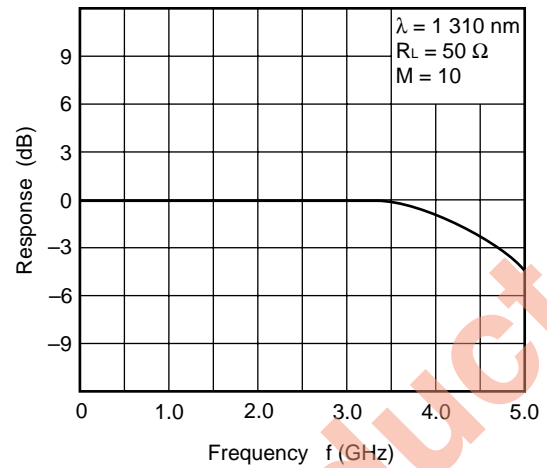
TYPICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$, unless otherwise specified)



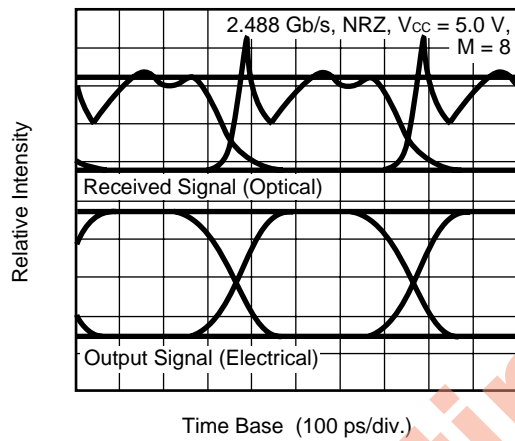
ERROR RATE CHARACTERISTICS



FREQUENCY RESPONSE



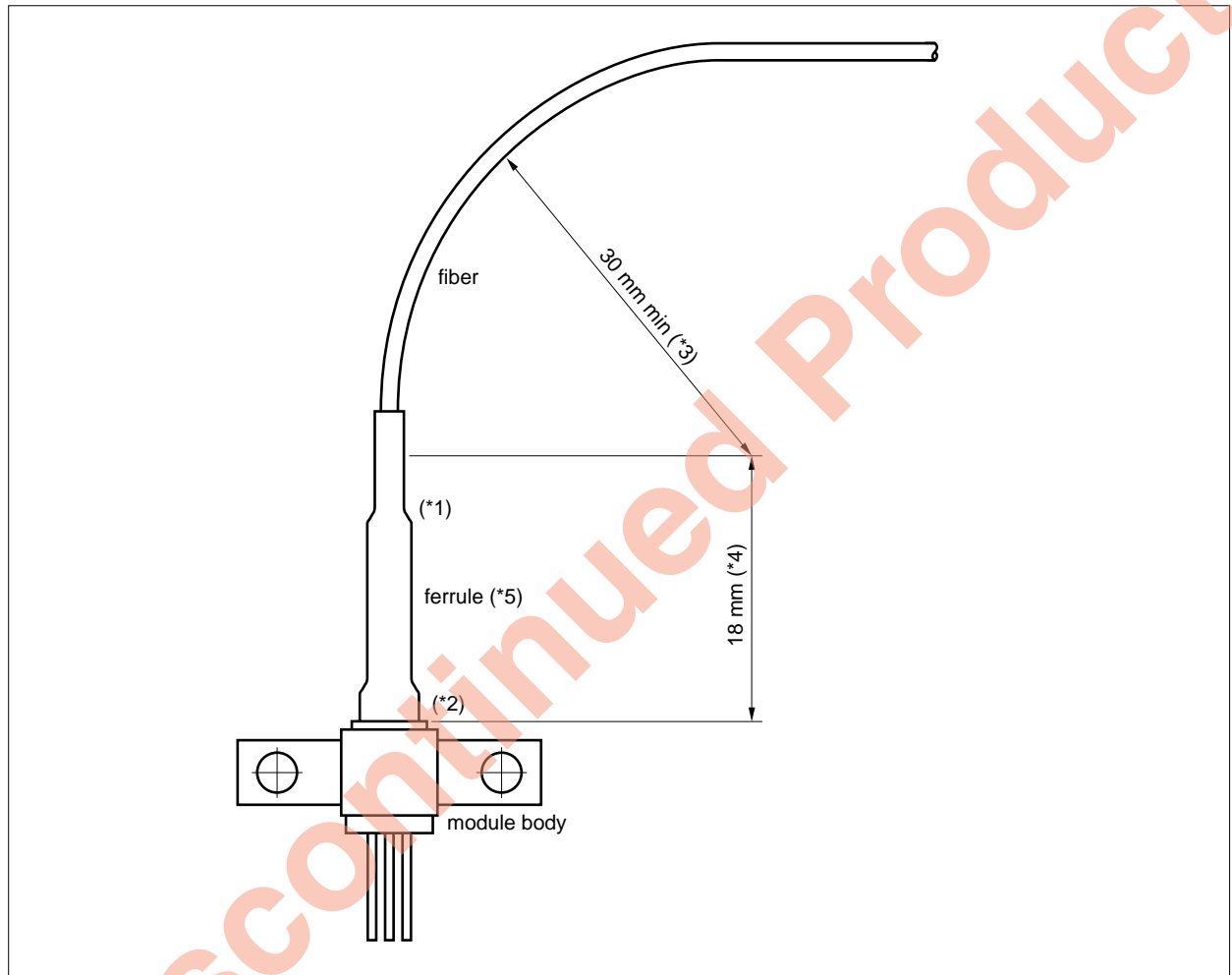
EYE DIAGRAM



HANDLING PRECAUTION for PD/APD MODULE

The NEC PD/APD module has heat shrink tubing to protect the ferrule edge (*1) and the junction between the ferrule and the module body (*2). In order to avoid breaking the fiber and/or optical coupling degradation, NEC recommends the following handling precautions.

1. Do not make the fiber bend radius less than 30 mm (*3).
2. Do not bend the fiber within the 18 mm section from the module body (*4).
3. Do not stress the ferrule with a lateral force exceeding 500 g (*5).



InGaAs APD/PD FAMILY

Features Packages	APD				PIN-PD			Remarks
	ϕ 30 μ m (for 2.5 Gb/s)	ϕ 50 μ m (for 2.5 Gb/s)	ϕ 50 μ m	ϕ 80 μ m	ϕ 50 μ m (for 2.5 Gb/s)	ϕ 80 μ m	ϕ 120 μ m	
TO-18 type CAN	NDL5530	—	NDL5500	NDL5510	—	—	—	3 pins
Chip on Carrier	NDL5530C	NDL5520C	NDL5500C	NDL5510C	—	—	—	
Receptacle Module	—	—	—	—	—	—	NDL5471RC NDL5471RD	3 pins RC: FC receptacle RD: SC receptacle
Coaxial Module with MMF	—	NDL5521P NDL5521P1 NDL5521P2	NDL5551P NDL5551P1 NDL5551P2 NDL5553P ^{*1} NDL5553P1 ^{*1} NDL5553P2 ^{*1} NDL5590P NDL5590P1 NDL5590P2	NDL5561P ^{*2} NDL5561P1 ^{*2} NDL5561P2 ^{*2}	NDL5421P NDL5421P1 NDL5421P2	NDL5461P NDL5461P1 NDL5461P2	—	P1, P2: With flange NDL5590P Series: With Pre-AMP
Coaxial Module with SMF	NDL5531P NDL5531P1 NDL5531P2 NDL5592P NDL5592P1 NDL5592P2	—	NDL5553PS ^{*1} NDL5553P1S ^{*1} NDL5553P2S ^{*1}	—	—	NDL5481P ^{*3} NDL5481P1 ^{*3} NDL5481P2 ^{*3}	—	P1, P2: With flange NDL5592P Series: With Pre-AMP
14-pin DIP Module with TEC	—	—	NDL5506P NDL5506PS	NDL5516P NDL5516PC	—	—	—	$\Delta T = 45$ K (@ $I_c = 1.1$ A) PS: With SMF
6-pin BFY Module with MMF	—	NDL5522P	—	—	NDL5422P	—	—	With Pre-AMP
8-pin Mini-DIL with SMF	—	—	—	—	—	—	NDL8800P	

*1 For OTDR

*2 With GI-62.5/125

*3 For analog application (optical CATV)

Remark Modules are available FC-PC connector or optional SC-PC connector.

REFERENCE

Document Name	Document No.
NEC semiconductor device reliability/quality control system	C11159E
Quality grades on NEC semiconductor devices	C11531E
Semiconductor device mounting technology manual	C10535E
Guide to quality assurance for semiconductor devices	MEI-1202
Semiconductor selection guide	X10679E

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

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NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device 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: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.