DATA SHEET

NEC

PHOTO DIODE

NDL5481P Series

1 300 nm OPTICAL ANALOG CATV SYSTEM
ϕ80 μm InGaAs PIN PHOTO DIODE MODULE WITH SMF

DESCRIPTION

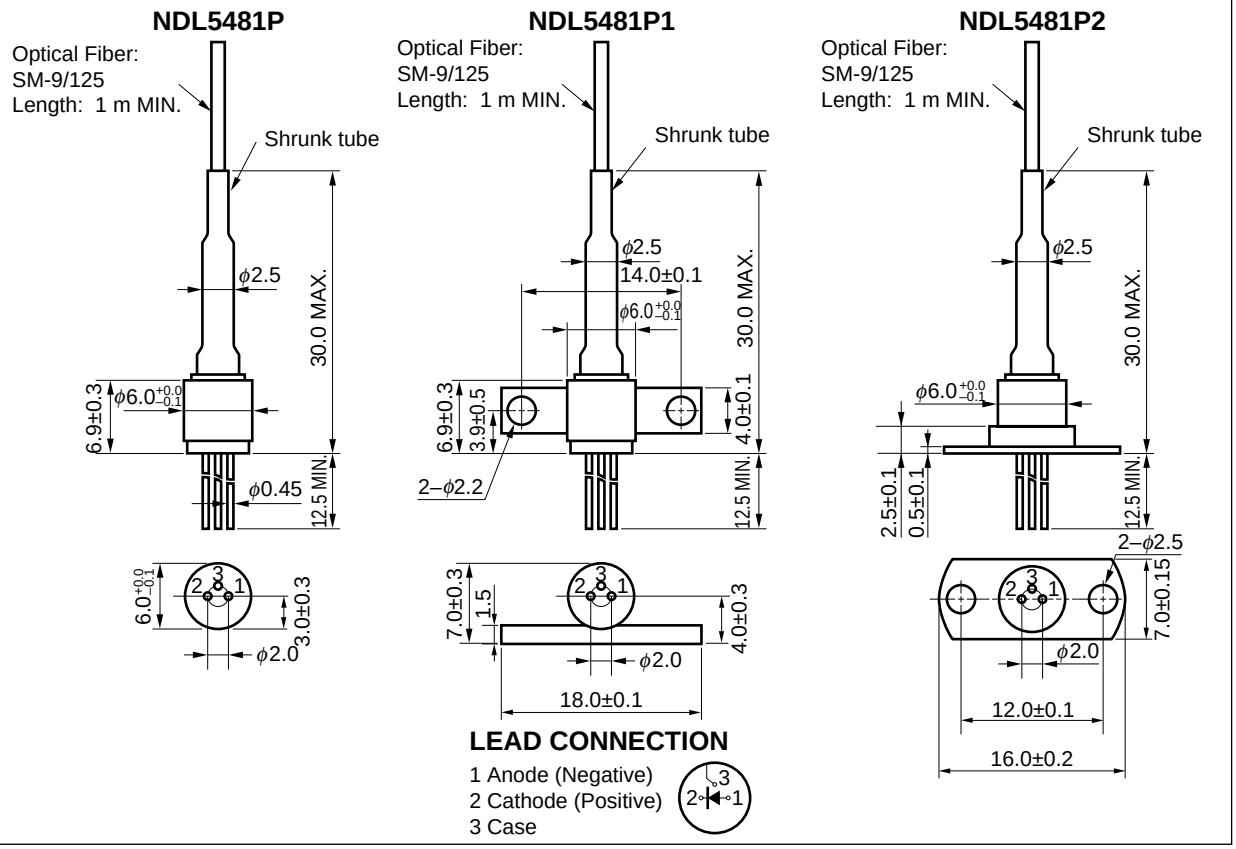
NDL5481P Series is InGaAs PIN photo diode modules with singlemode fiber. They are designed for analog transmission systems like CATV applications, and feature low intermodulation distortion and 40 dB minimum of optical return loss.

FEATURES

- Low intermodulation distortion IMD2 = –75 dBc MAX.
  IMD3 = –90 dBc MAX.
- Optical return loss 45 dB
- High quantum efficiency η = 81 % @ λ = 1 300 nm
- Small dark current I_D = 0.1 nA
- Small capacitance C_t = 0.7 pF
- Low operating voltage V_R = 10 V
- Detecting area size ϕ80 μm
- Coaxial module with singlemode fiber (SM-9/125)
- NDL5481P1 and NDL5481P2 have a flange.

★

PACKAGE DIMENSIONS
in millimeters



LEAD CONNECTION

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

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

Document No. P10311EJ3V0DS00 (3rd edition)
Date Published March 1996 P
Printed in Japan

The mark ★ shows major revised points.

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★ ORDERING INFORMATION

Part Number	Available Connector	
NDL5481P	Without Connector	no flange
NDL5481PC	With FC-UPC Connector	
NDL5481PD	With SC-UPC Connector	
NDL5481P1	Without Connector	flat mount flange
NDL5481P1C	With FC-UPC Connector	
NDL5481P1D	With SC-UPC Connector	
NDL5481P2	Without Connector	vertical flange
NDL5481P2C	With FC-UPC Connector	
NDL5481P2D	With SC-UPC Connector	

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C)

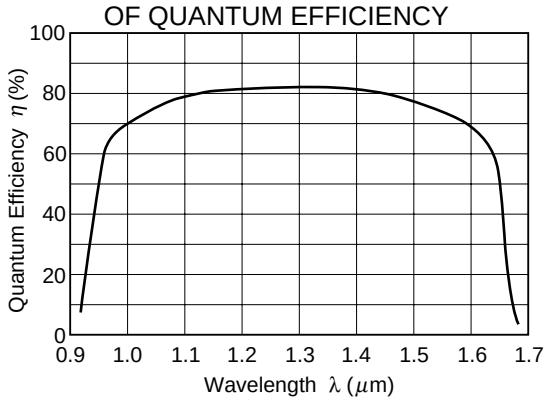
Parameter	Symbol	Ratings	Unit
Reverse Voltage	V_R	20	V
Forward Current	I_F	10	mA
Optical Input Power	P_{in}	8	mW
Operating Case Temperature	T_C	–40 to +85	°C
Storage Temperature	T_{stg}	–40 to +85	°C

ELECTRO-OPTICAL CHARACTERISTICS (T_C = 25 °C)

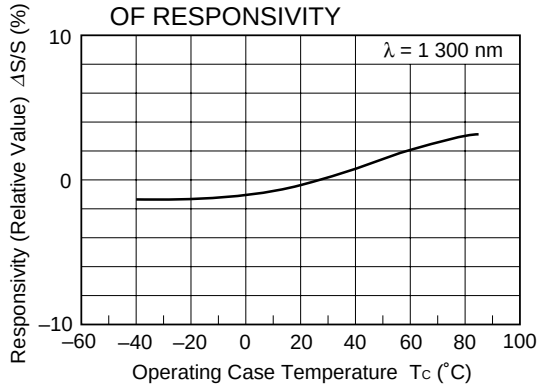
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Dark Current		I_D	V_R = 10 V		0.1	1.0	nA
Terminal Capacitance		C_t	V_R = 10 V, f = 1.0 MHz		0.7	1.0	pF
Quantum Efficiency		η	λ = 1 300 nm	76	81		%
Responsivity		S	λ = 1 300 nm	0.8	0.85		A/W
Cut-off Frequency		f_C	V_R = 10 V, λ = 1 300 nm, R_L = 50 Ω	2.5			GHz
Optical Return Loss		ORL	λ = 1 300 nm	40	45		dB
Intermodulation Distortion	2 order	IMD2	λ = 1 300 nm, 2 Laser 2 Tone Test, V_R = 10 V, OMI = 50 %/LD, P_{in} = 0.5 mW, f_1 = 187.25 MHz, f_2 = 193.25 MHz			–75	dBc
	3 order	IMD3				–90	dBc

TYPICAL CHARACTERISTICS ★

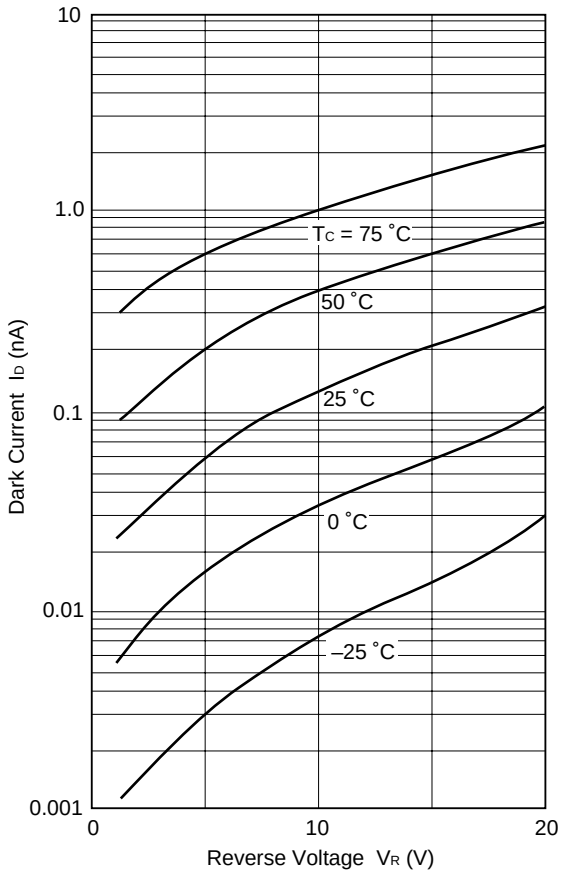
WAVELENGTH DEPENDENCE OF QUANTUM EFFICIENCY



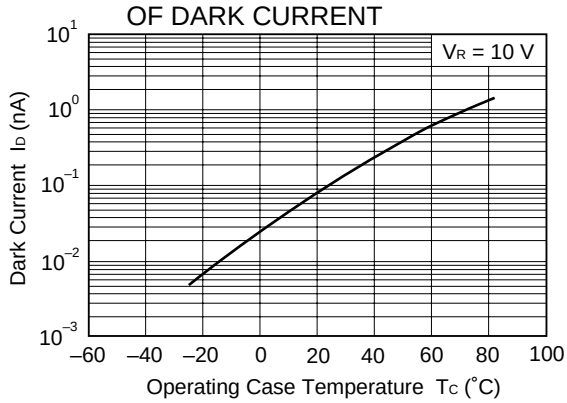
TEMPERATURE DEPENDENCE OF RESPONSIVITY



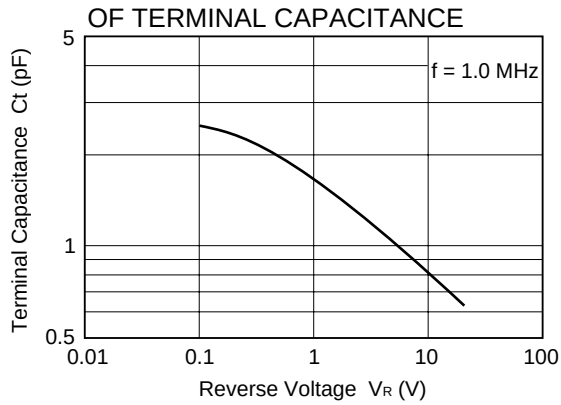
REVERSE VOLTAGE DEPENDENCE OF DARK CURRENT



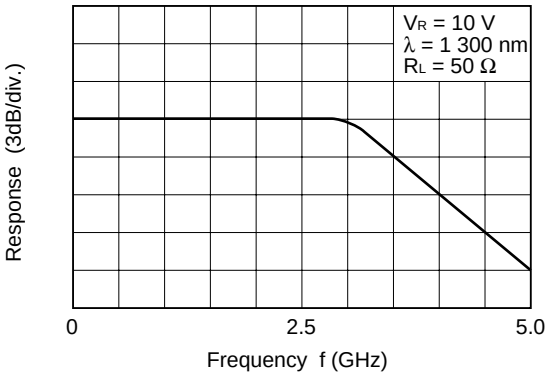
TEMPERATURE DEPENDENCE OF DARK CURRENT



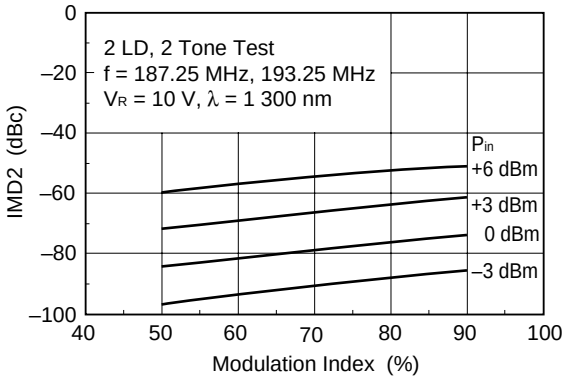
REVERSE VOLTAGE DEPENDENCE OF TERMINAL CAPACITANCE



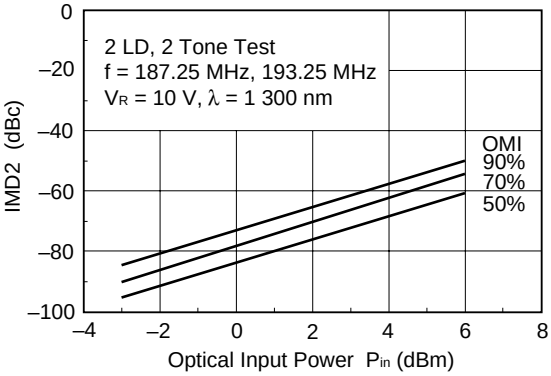
FREQUENCY RESPONSE



MODULATION INDEX vs. IMD2



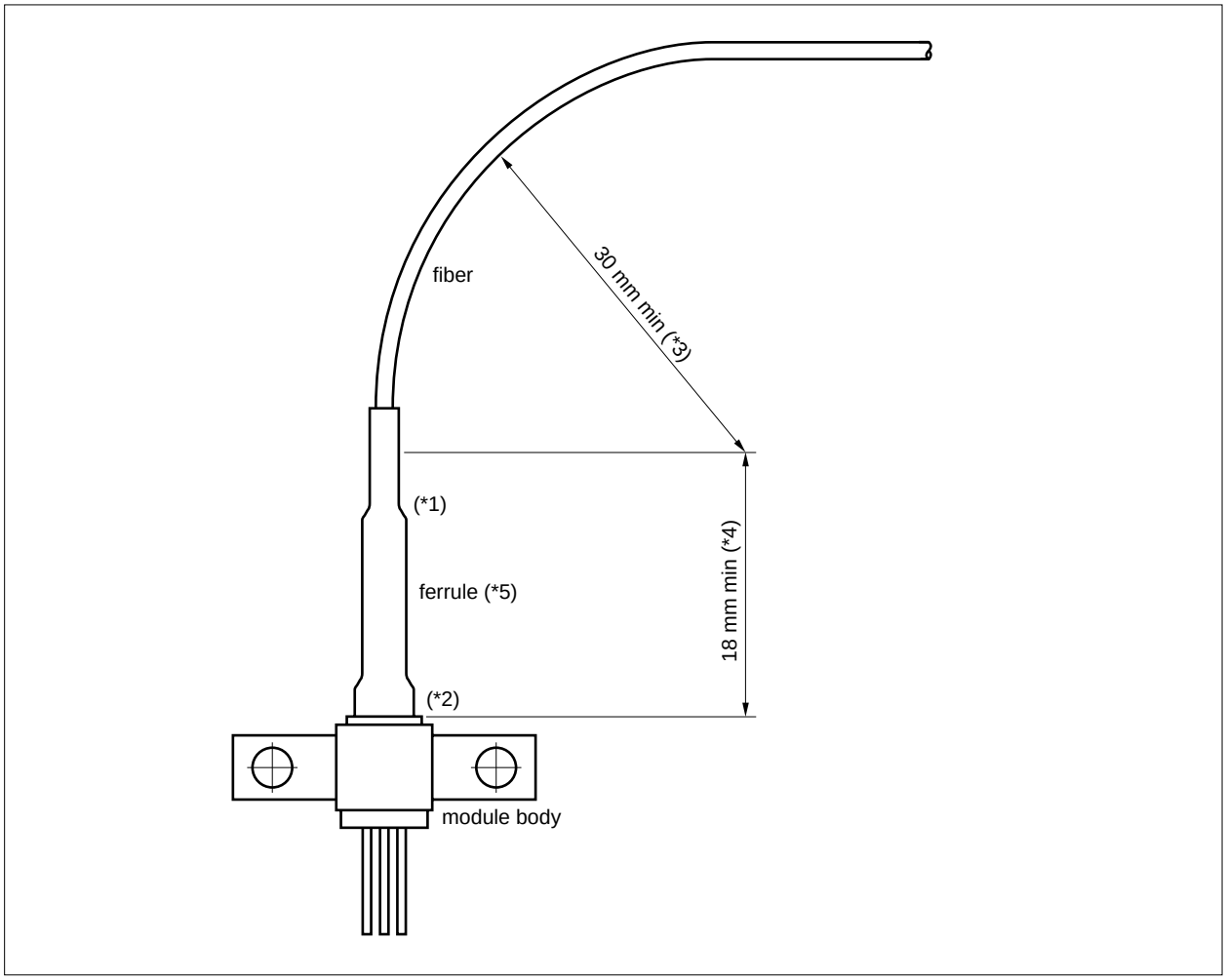
OPTICAL INPUT POWER vs. IMD2



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
	ϕ30 μm (for 2.5 Gb/s)	ϕ50 μm (for 2.5 Gb/s)	ϕ50 μm	ϕ80 μm	ϕ50 μm (for 2.5 Gb/s)	ϕ80 μm	
TO-18 type Can	NDL5530	———	NDL5500	NDL5510	———	———	3 pins
TO-18 type Can with Micro Lens	———	———	———	———	NDL5490L[*3,4]	NDL5405L	3 pins
Small Can ϕ5.6 μm	NDL5531	———	———	———	NDL5490[*3,4]	———	
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]	NDL5561P[*2] NDL5561P1[*2] NDL5561P2[*2]	———	NDL5461P NDL5461P1 NDL5461P2	P1, P2: With flange
Coaxial Module with SMF	———	———	NDL5553PS[*1] NDL5553P1S[*1] NDL5553P2S[*1]	———	———	NDL5481P[*5] NDL5481P1[*5] NDL5481P2[*5]	
14-pin DIP Module with TEC	———	———	NDL5506P NDL5506PS	———	———	———	ΔT = 45 K (@ Ic = 1.1 A) PS: With SMF
6-pin BFY Module with MMF	———	NDL5522P	———	———	NDL5422P	———	With Pre-AMP

***1** For OTDR
***2** With GI-62.5/125
***3** Under development
***4** Internal pre-amplifier for 1Gb/s
***5** For analog application (optical CATV)
Remark Modules are available with FC-PC connector or optional SC-PC connector.

REFERENCE

Document Name	Document No.
NEC semiconductor device reliability/quality control system	IEI-1205
Quality grade on NEC semiconductor devices	IEI-1209
Semiconductor device mounting technology manual	C10535E
Semiconductor device package manual	IEI-1213
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 circumstance 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.

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Anti-radioactive design is not implemented in this product.

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