NEC

1000 to 1600 nm OPTICAL FIBER COMMUNICATIONS ϕ30 μm InGaAs AVALANCHE PHOTO DIODE MODULE

NDL5531P SERIES

FEATURES

- **SMALL DARK CURRENT:**
  I_D = 5 nA
- **SMALL TERMINAL CAPACITANCE:**
  C_T = 0.35 pF at 0.9 $V_{(BR)R}$
- **HIGH QUANTUM EFFICIENCY:**
  η = 90% at λ = 1 300 nm, M = 1
  η = 77% at λ = 1 550 nm, M = 1
- **HIGH SPEED RESPONSE:**
  f_C = 2.5 GHz at M = 10
- **DETECTING AREA SIZE:**
  ϕ30 μm
- **COAXIAL MODULE WITH SINGLE MODE FIBER (SM-9/125)**

DESCRIPTION

The NDL5531P Series is an InGaAs avalanche photo diode module with single mode fiber. It is designed for detectors of long wavelength transmission systems. The series covers the wavelength range between 1000 and 1600 nm.

ELECTRO-OPTICAL CHARACTERISTICS (T_C = 25°C)

PART NUMBER PACKAGE OUTLINE			NDL5531P Series		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
$V_{(BR)R}$	Reverse Breakdown Voltage, I_D = 100 μA	V	50	70	100
δ	Temperature Coefficient of Reverse Breakdown Voltage[1]	%/°C		0.2	
I_D	Dark Current, V_R = $V_{(BR)R}$ x 0.9	nA		5	25
I_{DM}	Multiplied Dark Current, M = 2 to 10	nA		1	5
C_t	Terminal Capacitance, V_R = $V_{(BR)R}$ x 0.9, f = 1 MHz	pF		0.35	0.60
f_C	Cut-off Frequency, M = 10	GHz	2.5		
η	Quantum Efficiency, λ = 1 300 nm, M = 1	%	76	90	
	λ = 1 550 nm, M = 1		65	77	
S	Responsivity, λ = 1 300 nm, M = 1	A/W	0.80	0.94	
	λ = 1 550 nm, M = 1		0.81	0.96	
M	Multiplication Factor, λ = 1 300 nm, I_{PO} = 1.0 μA, V_R = V (at I_D = 1 μA)	M	30	40	
X	Excess Noise Factor[2], λ = 1 300 nm, 1 550 nm,			0.7	
F	I_{PO} = 1.0 μA, M = 10, f = 35 MHz, B = 1 MHz			5	

Note: 1. $\delta = \dfrac{V_{(BR)R} < 25°C + \Delta T°C > - V_{(BR)R} < 25°C>}{\Delta T°C > - V_{(BR)R} < 25°C>}$

2. $F = M^X$

ABSOLUTE MAXIMUM RATINGS[1]

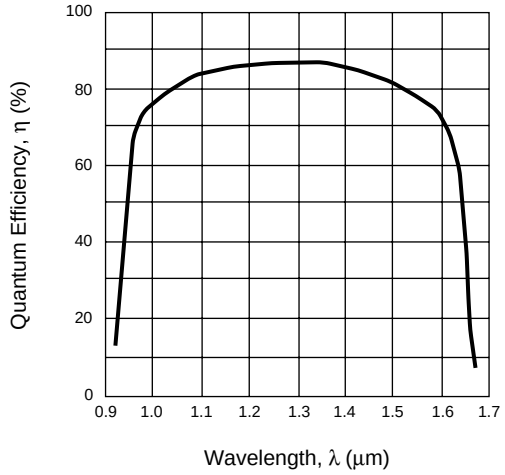
(T_C = 25°C, unless otherwise specified)

SYMBOLS	PARAMETERS	UNITS	RATINGS
I_F	Forward Current	mA	10
I_R	Reverse Current	mA	0.5
T_C	Operating Case Temp.	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-40 to +85

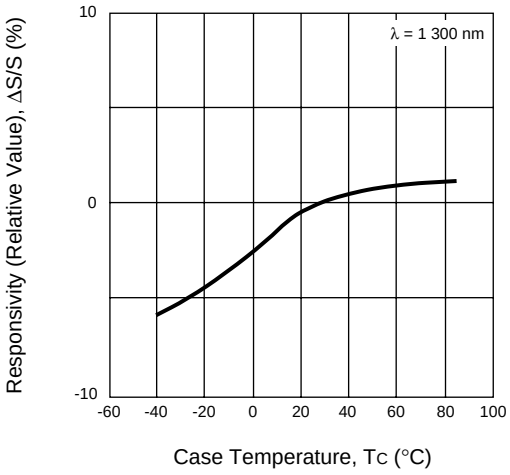
Note:
1. Operation in excess of any one of these parameters may result in permanent damage.

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

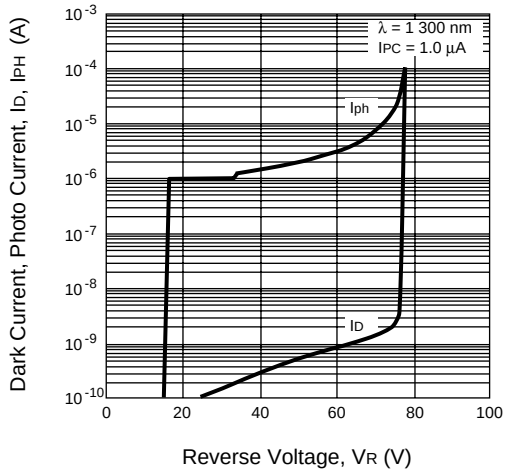
WAVELENGTH DEPENDENCE OF QUANTUM EFFICIENCY



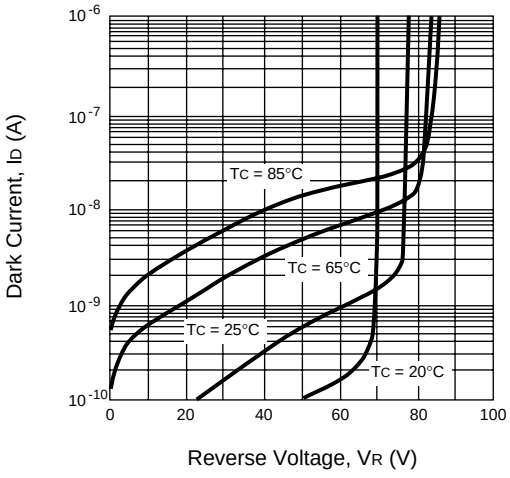
TEMPERATURE DEPENDENCE OF RESPONSIVITY



DARK CURRENT AND PHOTO CURRENT vs. REVERSE VOLTAGE

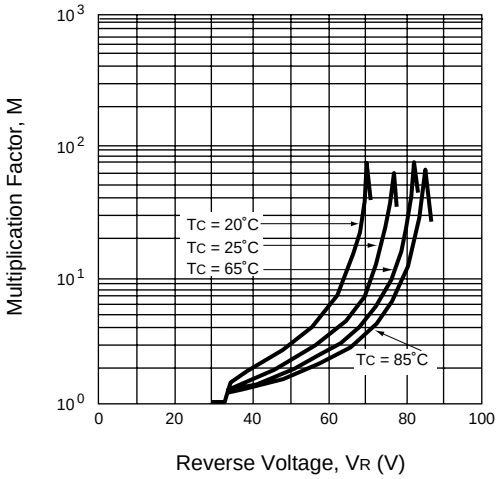


DARK CURRENT vs. REVERSE VOLTAGE

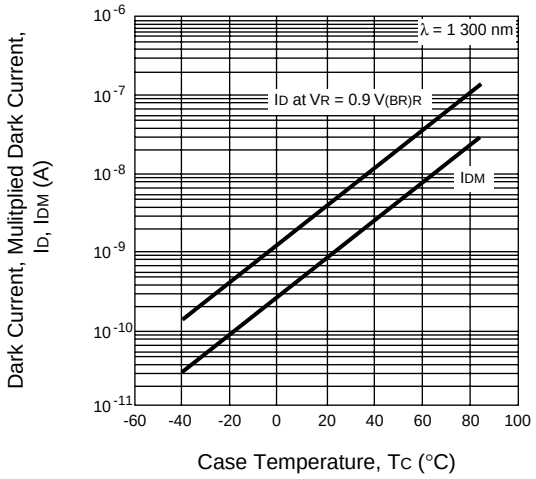


TYPICAL PERFORMANCE CURVES (T_C = -40 to +85°C)

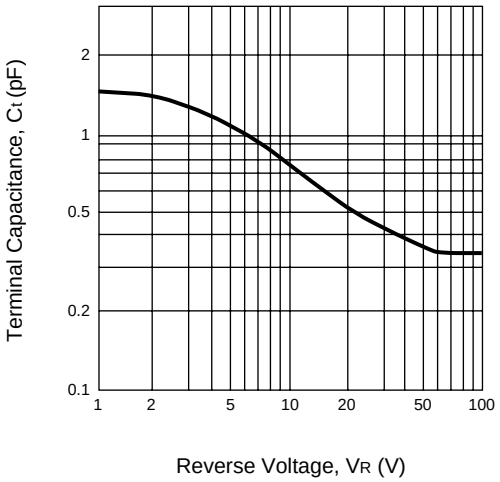
MULTIPLICATION FACTOR vs. REVERSE VOLTAGE



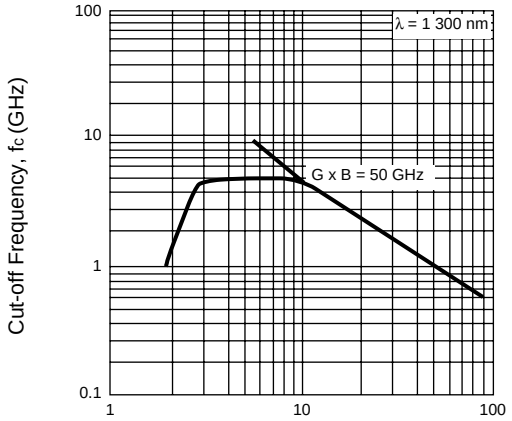
TEMPERATURE DEPENDENCE OF DARK CURRENT vs. MULTIPLIED DARK CURRENT



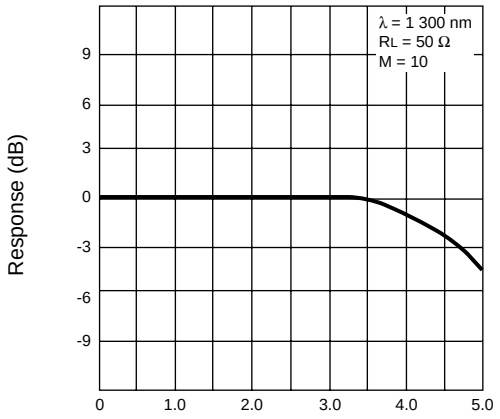
TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



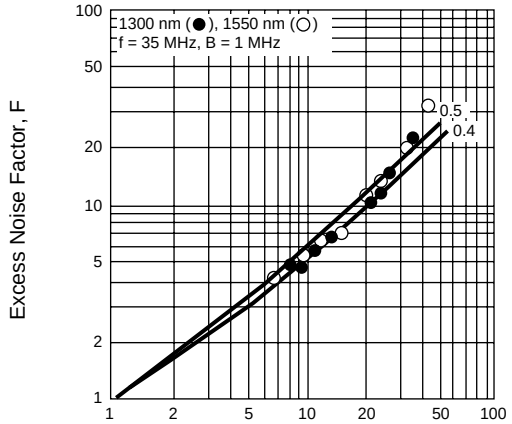
CUT-OFF FREQUENCY vs. MULTIPLICATION FACTOR



FREQUENCY RESPONSE

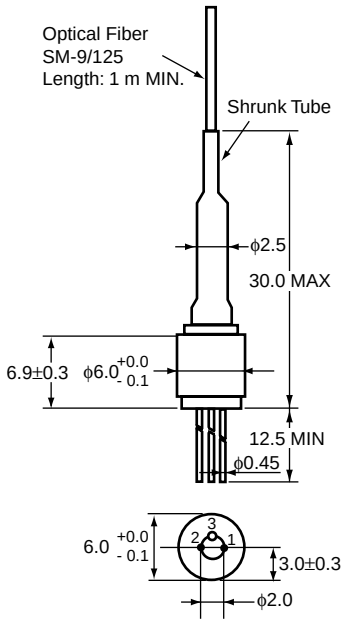


EXCESS NOISE FACTOR vs. MULTIPLICATION FACTOR

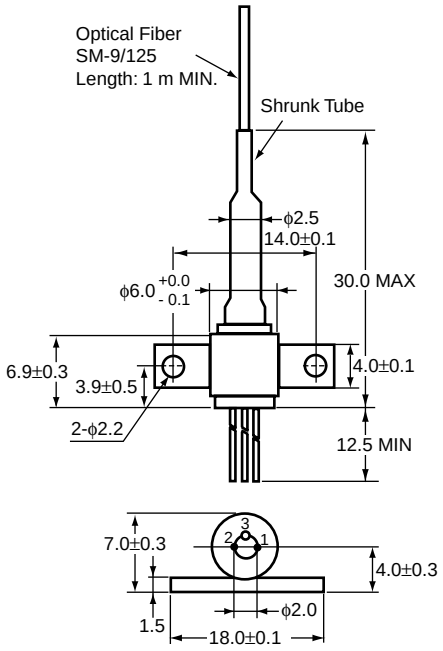


OUTLINE DIMENSIONS (Units in mm)

NDL5531P



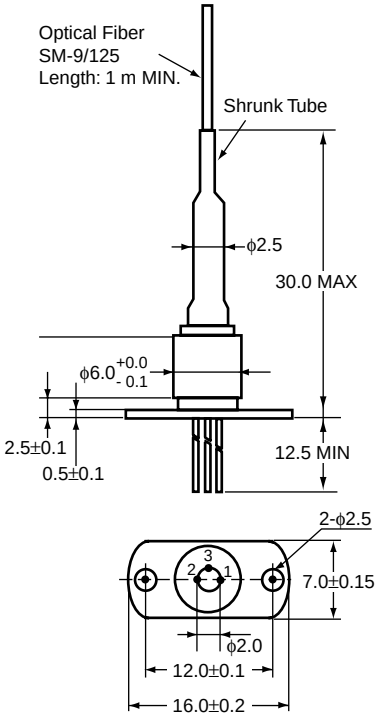
NDL5531P1



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



NDL5531P2



ORDERING INFORMATION

PART NUMBER	AVAILABLE CONNECTOR	DESCRIPTION
NDL5531P	Without Connector	No Flange
NDL5531PC	With FC-PC Connector	
NDL5531PD	With SC-PC Connector	
NDL5531P1	Without Connector	Flat Mount Flange
NDL5531P1C	With FC-PC Connector	
NDL5531P1D	With SC-PC Connector	
NDL5531P2	Without Connector	Vertical Flange
NDL5531P2C	With FC-PC Connector	
NDL5531P2D	With SC-PC Connector	

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).

