NEC

PHOTO DIODE

NDL5500C

1 000 to 1 600 nm OPTICAL FIBER COMMUNICATIONS
ϕ50 μm InGaAs AVALANCHE PHOTO DIODE

DESCRIPTION

NDL5500C is an InGaAs Avalanche Photo diode especially designed for a detector of long wavelength optical fiber communications systems. It covers the wavelength range between 1 000 and 1 600 nm with high sensitivity.

FEATURES

- Small dark current. I_D = 5 nA
- High sensitivity. η = 85 % @1 300 nm
  η = 80 % @1 550 nm
- High speed response. fc = 1.2 GHz @M = 20
- Detecting area size. ϕ50 μm

QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

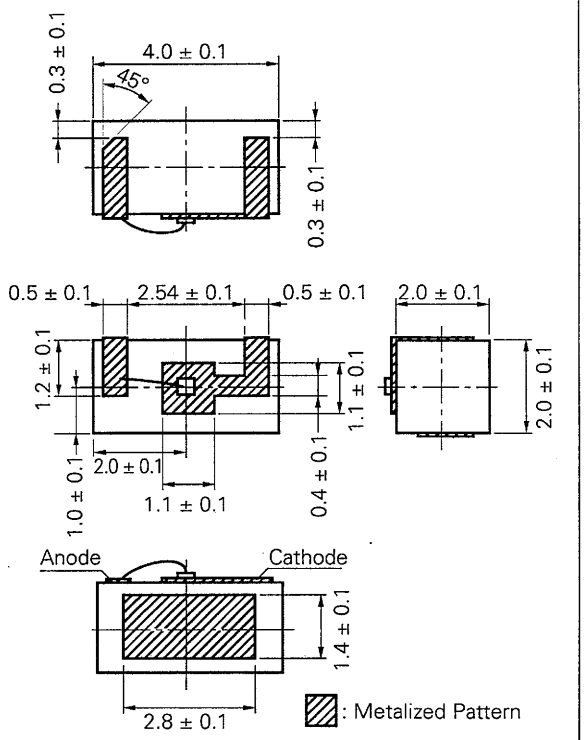
ABSOLUTE MAXIMUM RATINGS

(T_C = 25 °C, in dry nitrogen atmosphere)

Forward Current	I_F	10	mA
Reverse Current	I_R	0.5	mA
Operating Case Temperature	T_C	−40 to +70	°C
Storage Temperature	T_{stg}	−55 to +100	°C

PACKAGE DIMENSIONS

in millimeters



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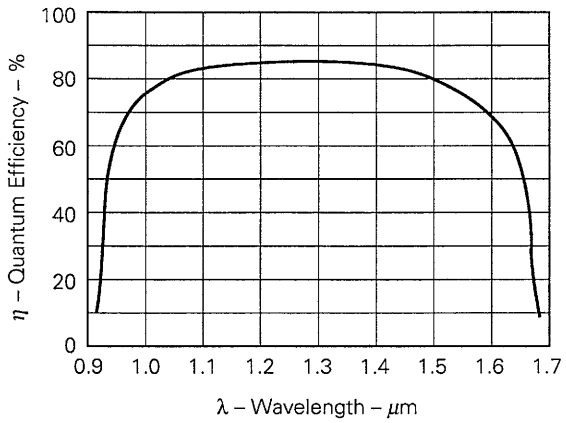
ELECTRO-OPTICAL CHARACTERISTICS (T_C = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Reverse Breakdown Voltage	$V_{(BR)R}$	50	70	100	V	I_D = 100 μA
Temperature Coefficient of Reverse Breakdown Voltage	δ *1		0.2		%/°C	
Dark Current	I_D		5	50	nA	$V_R = V_{(BR)R} \times 0.9$
Multiplied Dark Current	I_{DM}		1	5	nA	M = 2 to 10
Terminal Capacitance	C_t		0.4	0.8	pF	$V_R = V_{(BR)R} \times 0.9$, f = 1 MHz
Cut-off Frequency	fc	1			GHz	M = 10
			1.2			M = 20
Quantum Efficiency	η	70	85		%	λ = 1 300 nm
			80		%	λ = 1 550 nm
Sensitivity	S	0.73	0.89		A/W	λ = 1 300 nm
			1.00			λ = 1 550 nm
Multiplication Factor	M	20	40			λ = 1 550 nm, I_{PO} = 1.0 μA V_R = V (@ I_D = 1 μA)
Excess Noise Factor	x		0.7			λ = 1 300 nm, 1 550 nm, I_{PO} = 1.0 μA
Excess Noise Coefficient	F		5			M = 10, f = 35 MHz, B = 1 MHz
Effective Detecting Area Size	φE	30	40		μm	M = 10, 80 % of Peak

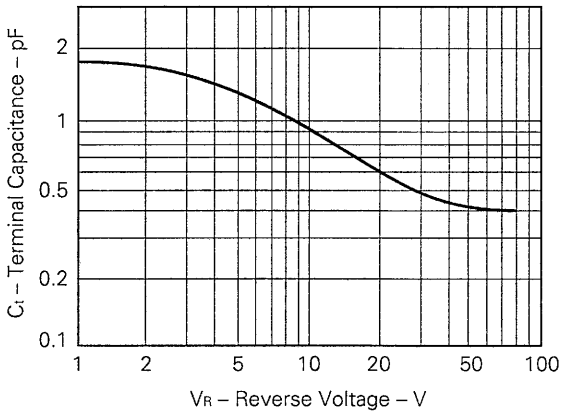
*1 : $$\delta = \frac{V_{(BR)R} < 25\ °C + \Delta T\ °C > - V_{(BR)R} < 25\ °C >}{\Delta T\ °C \cdot V_{(BR)R} < 25\ °C >}$$

TYPICAL CHARACTERISTICS (T_C = 25 °C)

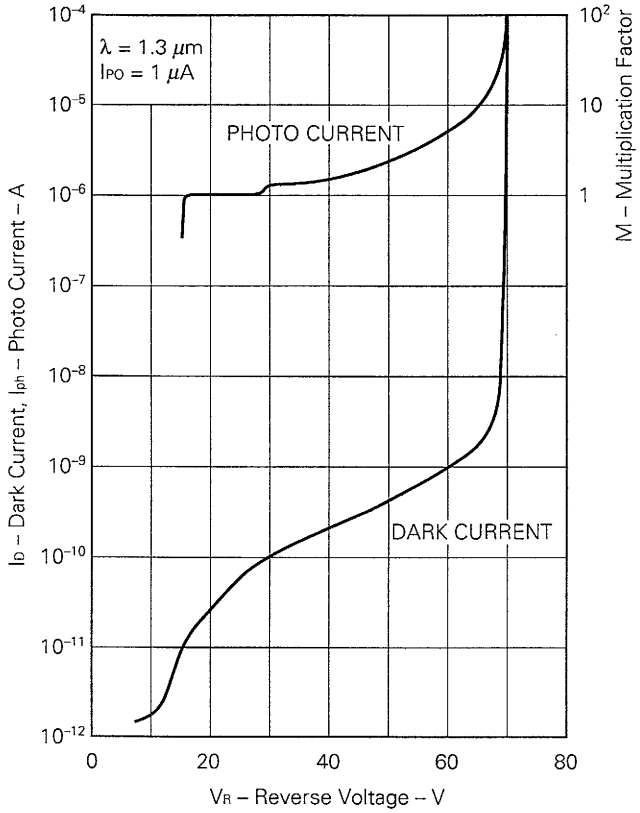
QUANTUM EFFICIENCY vs. WAVELENGTH



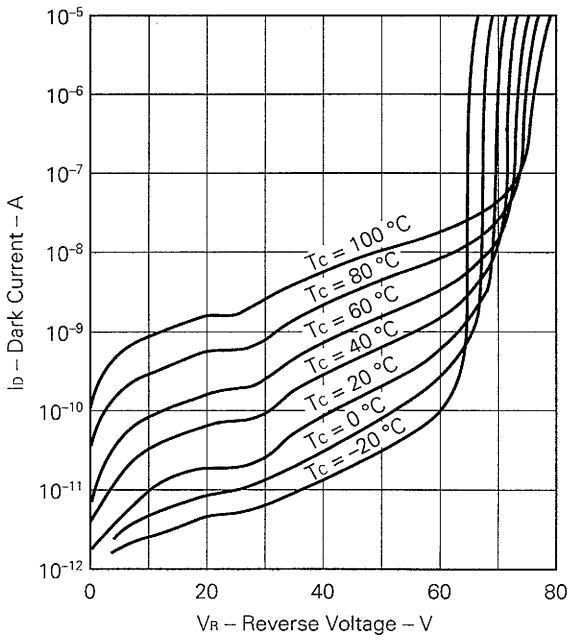
TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



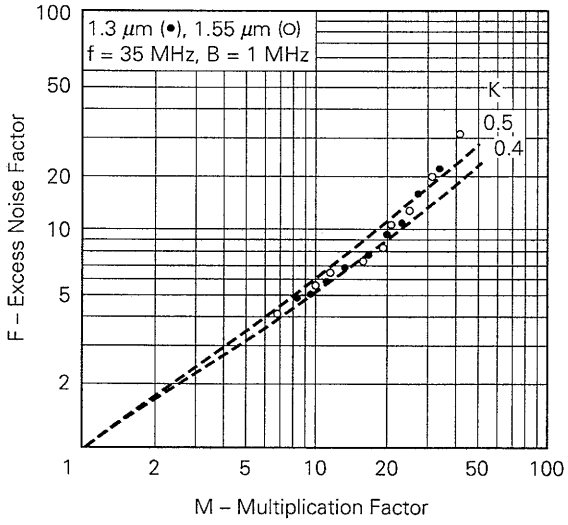
DARK CURRENT and PHOTO CURRENT vs. REVERSE VOLTAGE



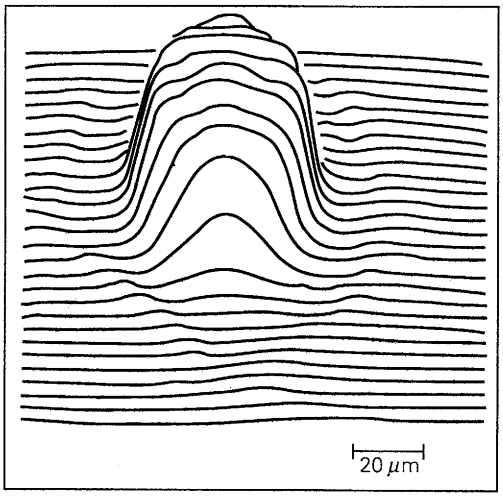
DARK CURRENT vs. REVERSE VOLTAGE



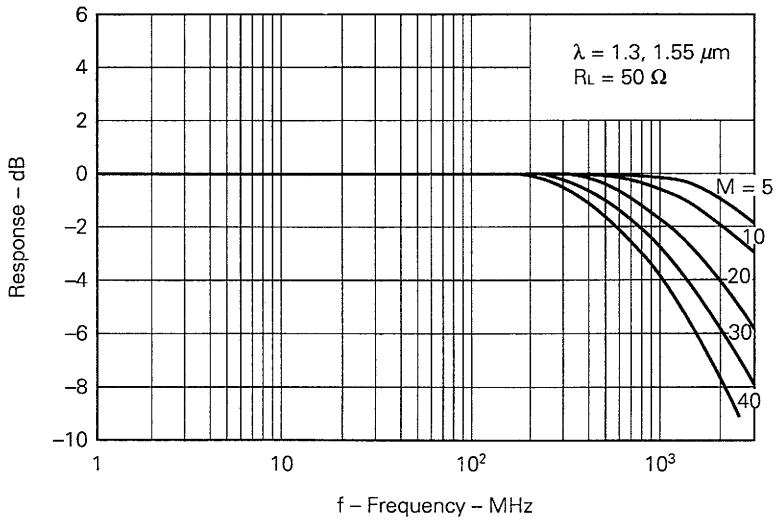
EXCESS NOISE FACTOR vs. MULTIPLICATION FACTOR



MULTIPLICATION MAP



FREQUENCY RESPONSE



DETECTOR CHIP ON CARRIER HANDLING PRE-CAUTION

DETECTOR CHIP ON CARRIER IS NON HERMETIC SEALED DEVICE.
THEREFORE, THERE IS A POSSIBILITY THAT RELIABILITY OF THE DEVICE IS AFFECTED BY STORAGE AND/OR ASSEMBLY CONDITION. IN ORDER TO ASSURE DEVICE RELIABILITY, NEC RECOMMENDS THE FOLLOWING CONDITIONS FOR HANDLING.

1) STORAGE CONDITIONS

WHEN THE DEVICE IS PRESERVED AFTER BREAKING CONTAINER SEAL, THE FOLLOWING CONDITION SHOULD BE MAINTAINED.

STORAGE TEMPERATURE	:	+20 °C to +30 °C
CONTAINER	:	CLEAN DRY BOX WITH ESD PROTECTION
AMBIENT GAS	:	DRY NITROGEN ATMOSPHERE

2) HANDLING/ASSEMBLY CONDITIONS

2-1) BONDING WIRE

ANY CONTACT TO BONDING WIRE SHOULD BE AVOIDED.

2-2) MAXIMUM TEMPERATURE IN ASSEMBLY CONDITIONS

THE FOLLOWING CONDITION SHOULD BE KEPT.

TEMPERATURE	DURATION	AMBIENT GAS
230 °C	1 minute	DRY NITROGEN ATMOSPHERE
175 °C	3 hours	
130 °C	100 hours	

2-3) PRE-CAP BAKING CONDITION

IN ORDER TO STABILIZE DARK CURRENT, NEC RECOMMENDS ONE OF THE FOLLOWING CONDITIONS FOR PRE-CAP BAKING.

TEMPERATURE	DURATION	AMBIENT GAS
120 °C to 150 °C	24 hours	DRY NITROGEN ATMOSPHERE

2-4) HERMETIC SEALING

THE DEVICE SHOULD BE FINALLY INSTALLED IN HERMETIC SEALED PACKAGE.
INERT GAS ATMOSPHERE SUCH AS NITROGEN IS RECOMMENDED.
HERMETISITY SHOULD BE LESS THAN 10^{-8} atm.cc/sec BY He LEAKAGE TEST.

2-5) ELECTRO STATIC DISCHARGE (ESD) PROTECTION

DURING HANDLING PROCESS, ESD PROTECTION SUCH AS EARTH-BAND SHOULD BE CARRIED OUT.

InGaAs APD/PD FAMILY

FEATURES / PACKAGES	APD			PIN-PD		REMARKS
	ϕ50 μm (for 2.5 Gb/s)	ϕ50 μm	ϕ80 μm	ϕ80 μm	270 × 330 μm^2	
TO-18 TYPE CAN	–	NDL5500	NDL5510	NDL5405	NDL5406	3 PIN
TO-18 TYPE CAN WITH MICRO LENS	–	–	–	NDL5405L	–	3 PIN
CHIP ON CARRIER	NDL5520C	NDL5500C	NDL5510C	NDL5405C	NDL5406C	
FC-RECEPTACLE MODULE	–	–	–	NDL5405RA1 NDL5405RA2 NDL5405RA3	–	3 PIN
COAXIAL MODULE WITH MMF	NDL5520P NDL5520P1	NDL5501P NDL5501P1	–	NDL5407P NDL5407P1	–	P1 : WITH FLANGE
COAXIAL MODULE WITH SMF	–	–	–	NDL5408P NDL5408P1	–	ANALOG APPLICATION (CATV)
14 PIN DIP MODULE WITH MULTI-MODE FIBER	–	NDL5506P	NDL5516P	–	–	WITH TEC NDL5506P: WITH GI-50 NDL5516P: WITH GI-62.5
6-PIN BFY MODULE WITH MMF	NDL5522P	–	–	NDL5422P*2 (for 2.5 Gb/s)	–	WITH PRE-AMP

*2 NDL5422P: ϕ50 μm, f_c = 2.5 GHz MIN.

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