



# NEC's SUPERLATTICE APD MODULE WITH INTERNAL PREAMPLIFIER FOR 10 Gb/s APPLICATIONS

## NR4270MU-CC

### FEATURES

- **SUPERLATTICE AVALANCHE PHOTO DIODE**
- **INTERNAL GaAs TRANSIMPEDANCE PREAMPLIFIER**
- **RECEIVER FOR 10 Gb/s TRANSMISSION**  
(STM-4, OC-192)
- **MINIMUM RECEIVER SENSITIVITY**  
 $P_r = -24$  dBm MAX
- **TRANSIMPEDANCE**  
 $Z_t = 60$  dB  $\Omega$  MIN
- **17-PIN MINI-BUTTERFLY PACKAGE WITH SINGLE MODE FIBER**
- **AC COUPLED-DIFFERENTIAL OUTPUT**
- **WITH SC-UPC CONNECTOR**

### DESCRIPTION

NEC'S NR4270MU-CC is a 10 Gb/s superlattice avalanche photo diode (APD) receiver in a 17-pin mini-butterfly package with an internal preamplifier. This module is ideal as a receiver for SONET OC-192 and Synchronous Digital Hierarchy (SDH) systems, STM-64, and ITU-T recommendations.

### ELECTRO-OPTICAL CHARACTERISTICS ( $T_c = 25^\circ\text{C}$ , $V_{ss} = -5.2$ V, $\lambda = 1550$ nm, unless otherwise specified)

PART NUMBER				NR4270MU-CC		
SYMBOLS	PARAMETERS AND CONDITIONS		UNITS	MIN	TYP	MAX
$V_{BR}$	Reverse Breakdown Voltage, $I_D = 10 \mu\text{A}$		V	16	-	32
$\delta^1$	Temperature Coefficient of Reverse Breakdown Voltage, $T_c = 0$ to $+70^\circ\text{C}$		mV/ $^\circ\text{C}$	5	-	40
$I_D$	Dark Current, $V_R = V_{BR} \times 0.9$		$\mu\text{A}$	-	-	1.2
S	Sensitivity, $M = 1$		A/W	0.63	-	-
$P_r$	Minimum Receiver Sensitivity,	PRBS = $2^{31}-1$ , 10 Gb/s, NRZ, BER = $10^{-12}$	$M = M_{opt}$	-	-25	-24
$P_O$		Overload,	$M = 3$	-8	-7	-
$f_c$	Cut-off Frequency, $R_L = 50 \Omega$ , $M = 9$ , $P_{IN} = -20$ dBm		GHz	7.0	8.0	-
$S_{22}$	RF OutputReturn Loss,	to 6 GHz	dB	-	-	10
		6 to 8 GHz	dB	-	-	8
$Z_t$	Transimpedance, $R_L = 50 \Omega$		dB $\Omega$	60	-	-
$P_D$	IC Power Dissipation		mW	-	500	600
ORL	Optical Return Loss		dB	-	-	27
$R_{th}$	Thermistor Resistance		k $\Omega$	9.5	10	10.5

Note:

$$1. \delta = \frac{\Delta V_{BR}}{\Delta T_c}$$

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>**

(T<sub>C</sub> = 25°C, unless otherwise specified)

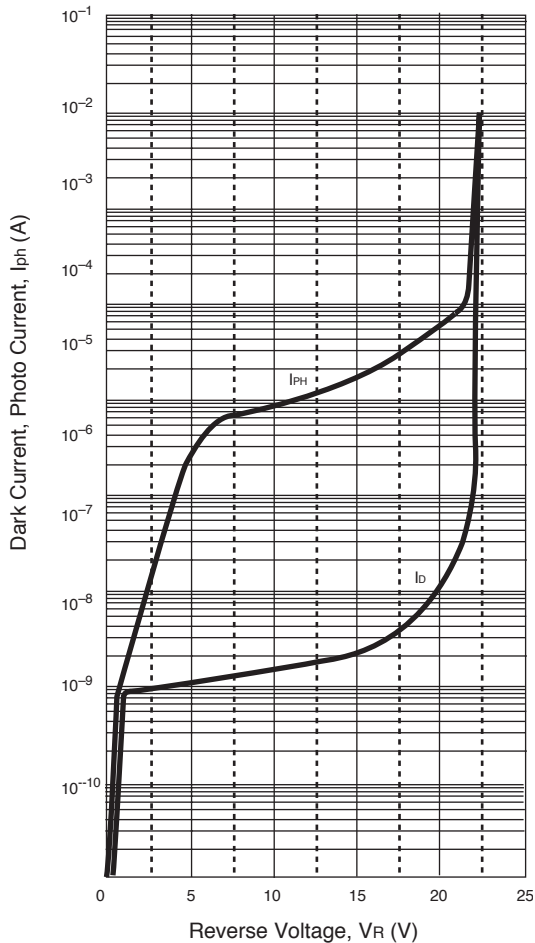
SYMBOLS	PARAMETERS	UNITS	RATINGS
I <sub>F</sub>	APD Forward Current	mA	5
V <sub>R</sub>	APD Reverse Voltage	V	V <sub>BR</sub>
I <sub>R</sub>	APD Reverse Current	mA	1.0
V <sub>SS</sub>	IC Supply Voltage	V	-6 to 0
T <sub>C</sub>	Operating Case Temperature	°C	0 to +70
T <sub>STG</sub>	Storage Temperature	°C	-40 to +85
T <sub>SLD</sub>	Lead Soldering Temperature	°C	350 (3 sec.)

Note:

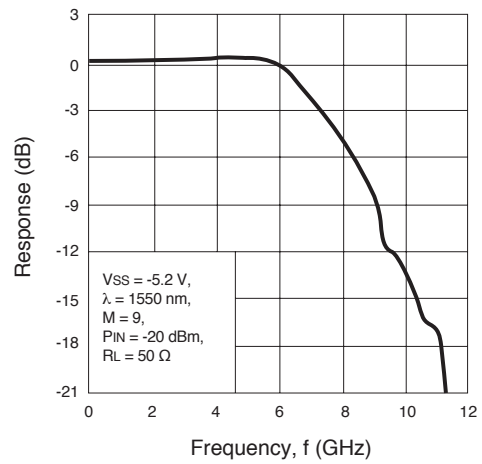
1. Operation in excess of any one of these parameters may result in permanent damage.

**TYPICAL PERFORMANCE CURVES** (T<sub>C</sub> = 25°C)

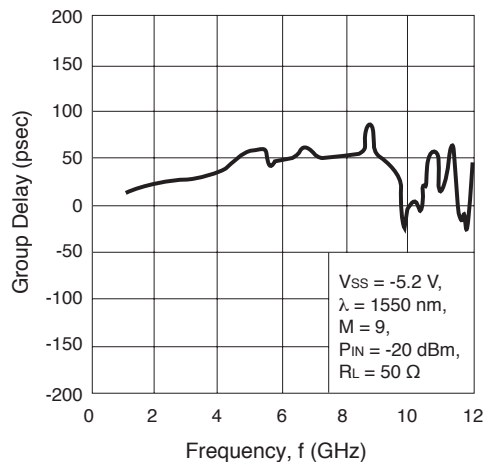
**DARK CURRENT AND PHOTO CURRENT vs. REVERSE VOLTAGE**



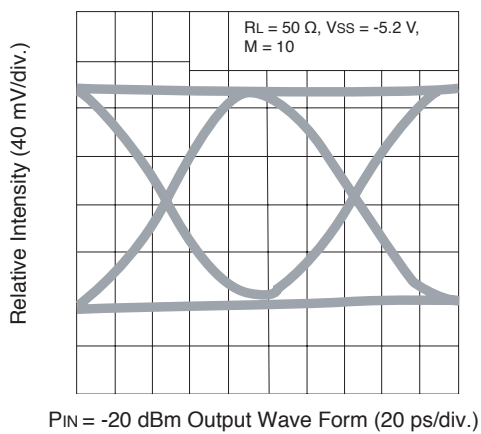
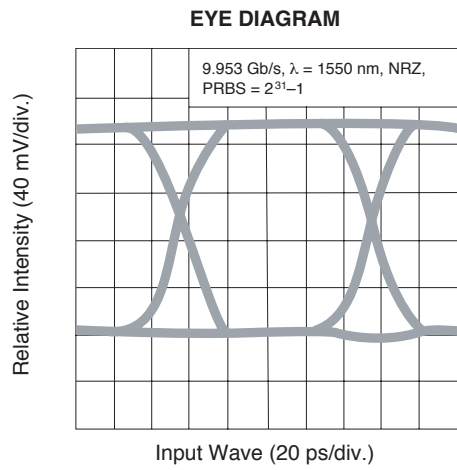
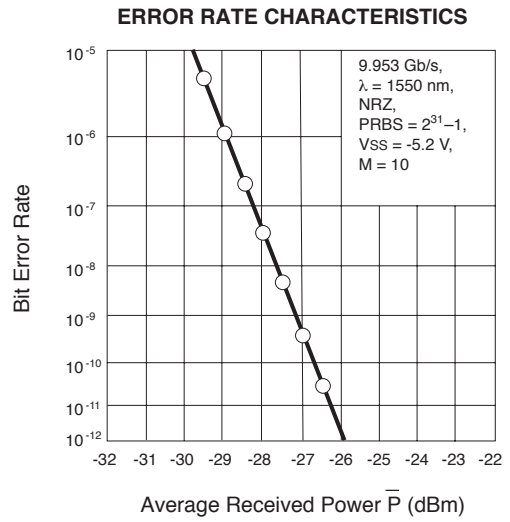
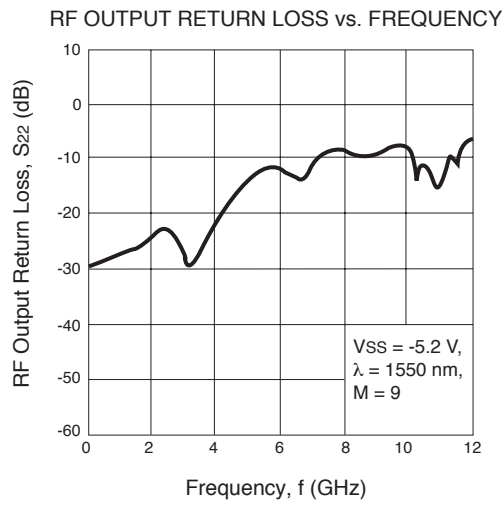
**FREQUENCY RESPONSE**



**GROUP DELAY vs. FREQUENCY**

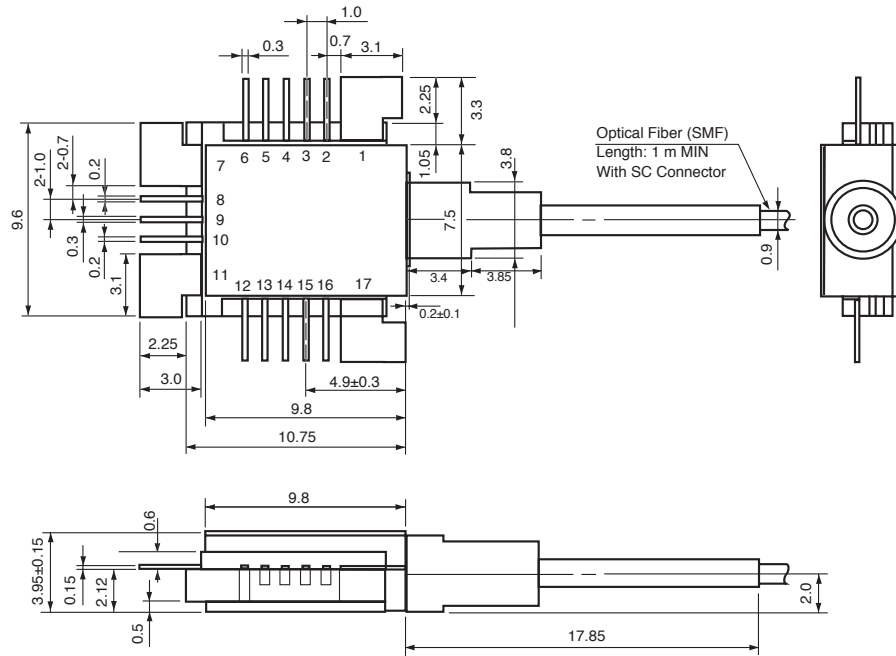


**TYPICAL PERFORMANCE CURVES** ( $T_c = 25^\circ\text{C}$ )



Remark: The graphs indicate nominal characteristics.

**OUTLINE DIMENSIONS** (Units in mm, ±0.2 mm unless otherwise specified)



**PIN CONNECTIONS**

PIN No.	SYMBOL	FUNCTION	PIN No.	SYMBOL	FUNCTION	PIN No.	SYMBOL	FUNCTION
1	GND	Ground (0.0V)	8	OUT	OUTPUT (INVERT)	15	Thm	THERMISTOR
2	Vapd	APD CATHODE	9	GND	GROUND (0.0V)	16	Thm	THERMISTOR
3	NC	NC	10	OUT	OUTPUT (NON-INVERT)	17	GND	GROUND (0.0 V)
4	Vss	POWER SUPPLY (-5.2V)	11	GND	GROUND (0.0V)			
5	NC	NC	12	GND	GROUND (0.0V)			
6	GND	GROUND (0.0V)	13	NC	NC			
7	GND	GROUND (0.0V)	14	NC	NC			

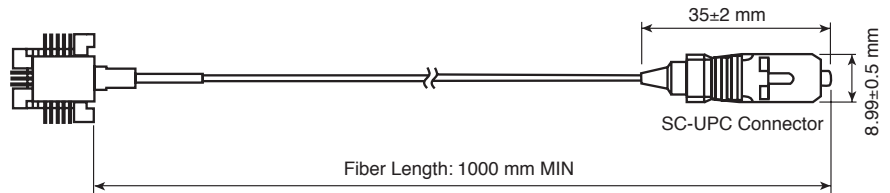
**OPTICAL FIBER CHARACTERISTICS**

PARAMETER	SPECIFICATION	UNIT
Mode Field Diameter	9.5±1	µm
Cladding Diameter	125±2	µm
Maximum Cladding Noncircularity	2	%
Maximum Core/Cladding Concentricity	1.6	%
Outer Diameter	0.9±0.1	mm
Cut-off Wavelength	1100 to 1270	nm
Minimum Fiber Bending Radius	30	mm
Fiber Length	1000 MIN	mm
Flammability	ULT1581 VW-1	

**ORDERING INFORMATION**

Part Number	Available Connector
NR4270MU-CC-AZ*	With SC-UPC Connector

**\*NOTE:**  
Please refer to the last page of this data sheet, "Compliance with EU Directives" for Pb-Free RoHS Compliance Information.



**Life Support Applications**

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DATA SUBJECT TO CHANGE WITHOUT NOTICE

02/27/2003

Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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