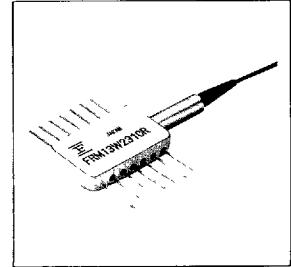


DESCRIPTION

The FRM13W231CR is an APD pre-amplifier module for 1300nm wavelength optical receiver front-end. It contains a planar InGaAs-APD (Avalanche Phto-diode) and a transimpedance type GaAs pre-amplifier IC.

The InGaAs-APD, having high responsivity, low capacitance and low noise characteristics, converts an incident optical signal to an electrical current signal effectively. An InGaAs-APD has internal gain and multiplies the current signal. The following the low noise transimpedance pre-amplifier, having an inverted gain, converts the electrical current signal to a voltage signal. The output of the pre-amplifier must be connected to user prepared post amplifier in AC-coupled manner.

The required DC voltage supplies are the APD bias voltage V_R and the pre-amplifier supply voltage V_{SS} ($-5.2V$ typ.). Each voltage supply lead is by-passed by capacitors internally. Additional capacitors and inductors are recommended to realize the stabilization of supply voltage. The hermetically sealed butterfly type package with a single mode fiber pigtail is easy to be mounted on a PC-board. The module is epoxy free internally. The internal gain of APD(M) can be adjusted by supply voltage V_R . The sensitivity of better than $-30dBm$ is achievable. To maintain the optimum M when temperature changes, V_R must be temperature compensated. The typical V_R compensation rate is $0.15\%/^{\circ}C$.



FEATURES

- Long wavelength region operation
- InGaAs-Avalanche photodiode
- Monolithic GaAs transimpedance pre-amplifier
- Bandwidth of 1.7GHz min.
- High sensitivity of $-30dBm$ at 2.4Gb/s systems
- Wide dynamic range
- 14 pin butterfly type package with single mode fiber
- Baseband operation

FRM13W231CR

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit
Storage Temperature	T_{stg}	-40 to +85	$^\circ\text{C}$
Operating Temperature	T_{op}	-20 to +70	$^\circ\text{C}$
Supply Voltage	V_{SS}	-7 to 0	V
Supply Voltage	V_{R}	0 to $V_{\text{B}}^{(1)}$	V
APD Reverse Current	I_{R}	500	μA

1) V_{B} differs from device to device. V_{B} data is attached to each device.

2) Please do not solder the package. The package has case ground pins. Please use these pins for ground.

OPTICAL AND ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{\text{SS}} = -5.2\text{V}$, $\lambda = 1300\text{nm}$)

Parameter	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Responsivity	R	M=1	0.7	0.8	—	A/W
Breakdown Voltage	V_{B}	$I_{\text{D}} = 10\mu\text{A}$	—	80	100	V
Temperature Coefficient of V_{B}	γ	$\gamma = (1/V_{\text{B}}) \times (dV_{\text{B}}/dT) \times 100$	—	0.15	—	$\%/^\circ\text{C}$
Transimpedance	Z_{t}	DC, $R_{\text{L}} = \infty$	—	220	—	Ω
Bandwidth	B_{W}	AC-Coupled, M=10 $R_{\text{L}} = 50\Omega$ -3dB from 1MHz	1.7	—	—	GHz
Sensitivity	P_{r}	2.4Gb/s NRZ 2^{15-1} P.R.B.S. B.E.R. = 10^{-9} V_{R} is set at optimum value	-30	—	—	dBm
Dynamic Range	D_{r}		25	—	—	dB
Power Supply Current	I_{SS}		—	—	40	mA
Recommended Supply Voltage	V_{SS}		-5.46	-5.2	-4.94	V

AI PRE-AMPLIFIER MODULE

TYPICAL CHARACTERISTICS

Fig. 1 Frequency Response

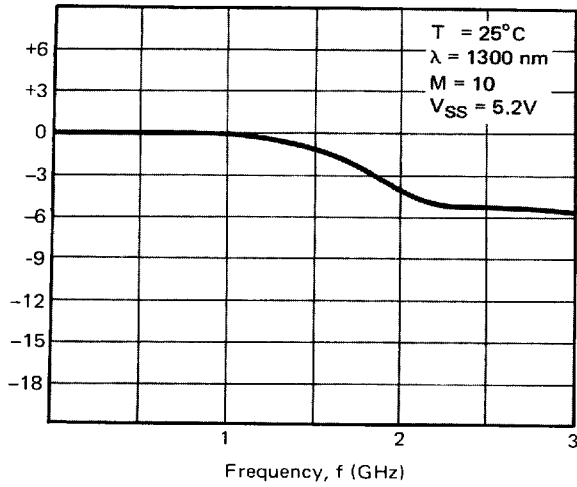


Fig. 2 Pulse Response

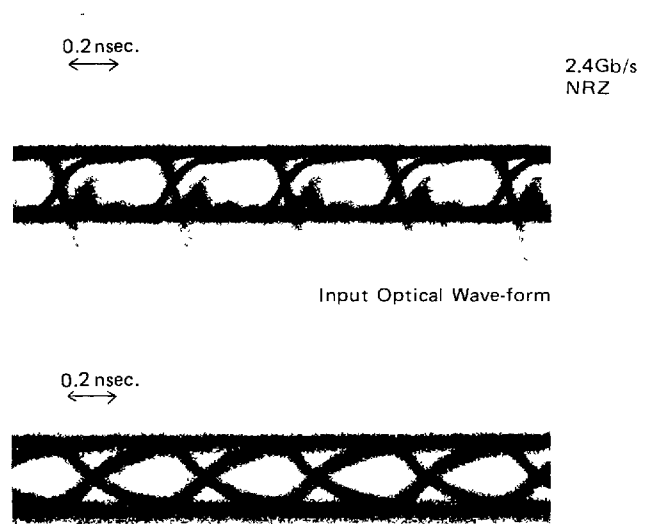


Fig. 3 Bit Error Rate Characteristics

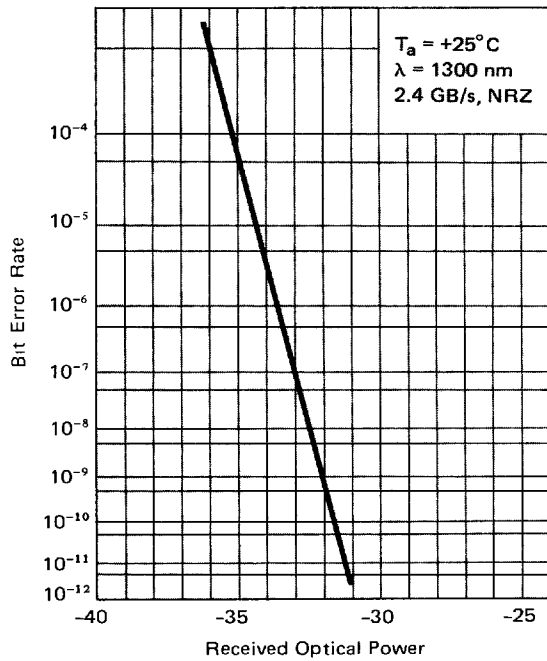


Fig. 4 Equivalent Input Noise Current Density

