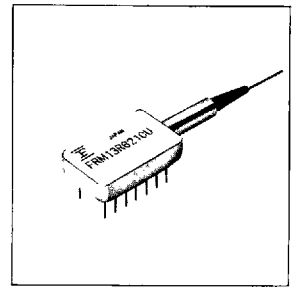
FRM15U621CU

APD PRE-AMPLIFIER MODULE

DESCRIPTION



The FRM15U621CU is an APD pre-amplifier module for 1300 and 1550nm wavelength optical receiver front-end. It contains a planar InGaAs-APD (Avalanche Photo-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 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 an 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 voltages.
The hermetically sealed dual-in-line package with GI multimode fiber pigtail (50/125μm, N.A. = 0.21) is easy to be mounted on PC-board. The module is epoxy free internally. A taper-ended fiber guides the optical signal to the photo-diode efficiently. An internal gain of APD(M) can be adjusted by the supply voltage V_R. At 680Mb/s NRZ format, the sensitivity achieved at M=10 is better than –38dBm. To maintain the optimum M when temperature changes, V_R must be temperature compensated. The typical V_R compensation rate is 0.15%/°C.

FEATURES

- Long wavelength region operation
- InGaAs-Avalanche photodiode
- Monolithic GaAs transimpedance pre-amplifier
- Bandwidth of 600MHz min.
- High sensitivity of –38dBm at 565Mb/s systems
- Wide dynamic range
- 14 pin DIL package with GI multimode fiber
- Baseband operation

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ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Parameter	Symbol	Ratings	Unit
Storage Temperature	T_{stg}	-40 to +85	°C
Operating Temperature	T_{op}	-20 to +70	°C
Supply Voltage	V_{SS}	-7 to 0	V
Supply Voltage	V_R	0 to V_B	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 three case ground pins. Please use these pins for ground.

OPTICAL AND ELECTRICAL CHARACTERISTICS (T_a = 25°C, V_{SS} = -5.2V, λ = 1550nm)

Parameter	Symbol	Test Conditions	Limit			Unit
			Min.	Typ.	Max.	
Responsivity	R	λ = 1550nm M = 1	0.7	0.8	–	A/W
Breakdown Voltage	V_B	I_D = 10μA	60	80	100	V
Temperature Coefficient of V_B	γ	γ = (1/V_B)X(dV_B/dT) X100	–	0.1	–	%/°C
Transimpedance	Z_t	DC, R_L = ∞	–	1	–	KΩ
Bandwidth	BW	AC-Coupled, M=10 R_L = 50Ω -3dB from 1MHz	600	–	–	MHz
Sensitivity	P_r	680Mb/s NRZ 2^{15-1} P.R.B.S. B.E.R. = 10^{-9} V_R is set at optimum value(1)	-38	–	–	dBm
Dynamic Range	D_r		30	–	–	dB
Power Supply Current	I_{SS}		–	–	40	mA
Recommended Supply Voltage	V_{SS}		-5.46	-5.2	-4.94	V

(1) V_R is accompanied with each device.

TYPICAL CHARACTERISTICS

Fig. 1 Power Supply Current

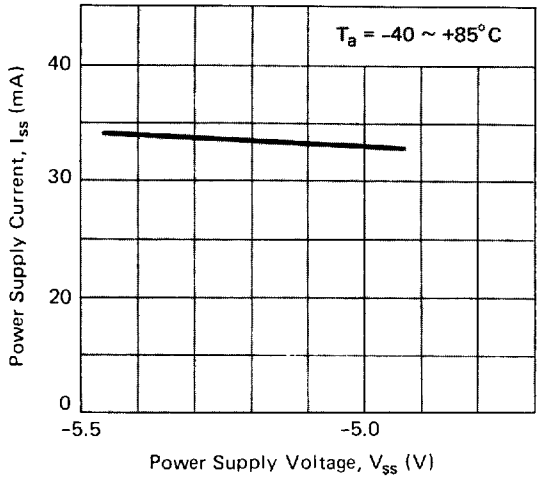


Fig. 2 Received Optical Power vs. Output Voltage

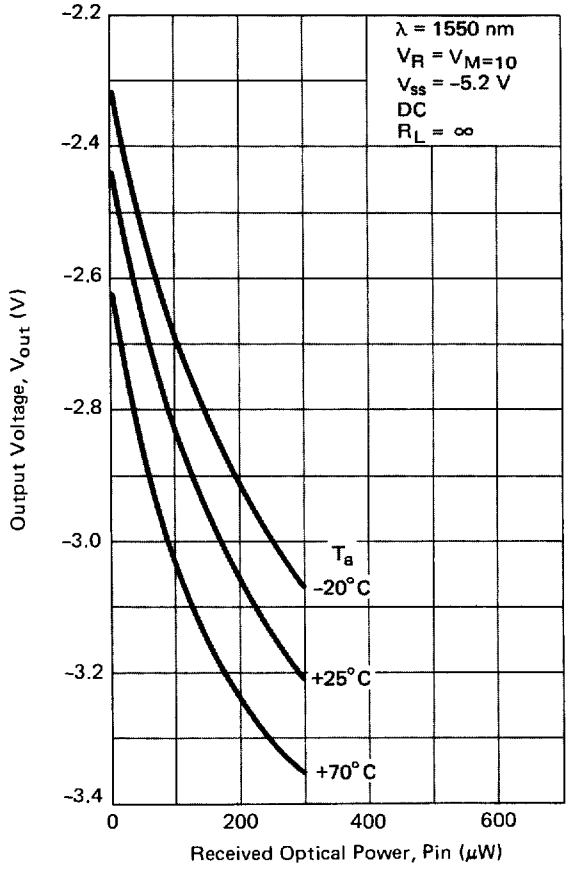


Fig. 3 Received Optical Power vs. Output Voltage

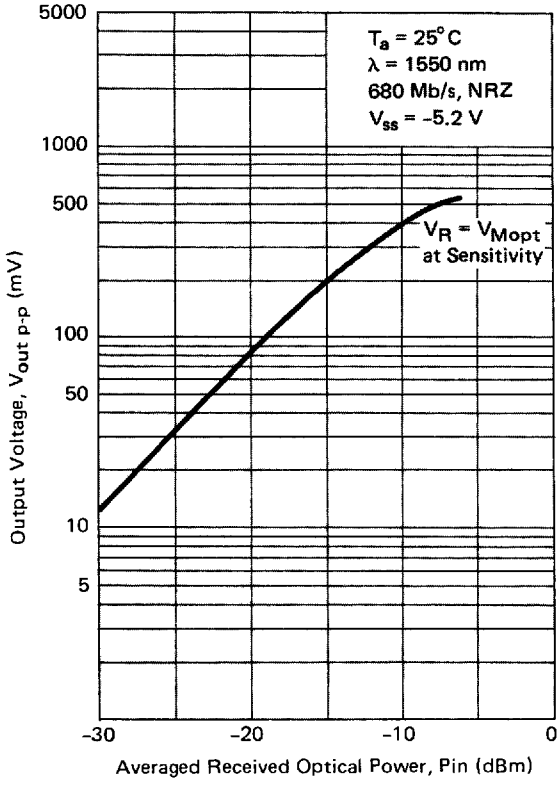


Fig. 4 Frequency Response

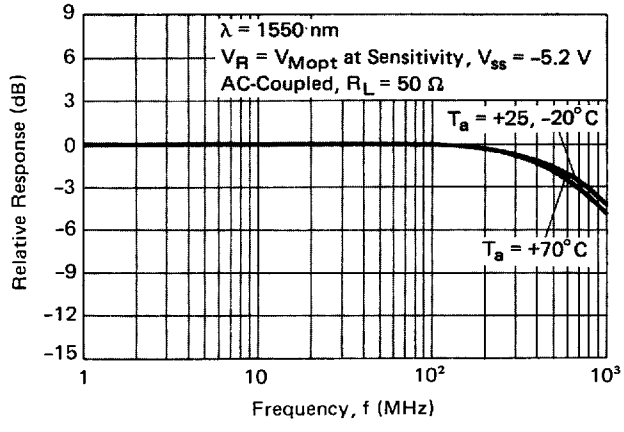
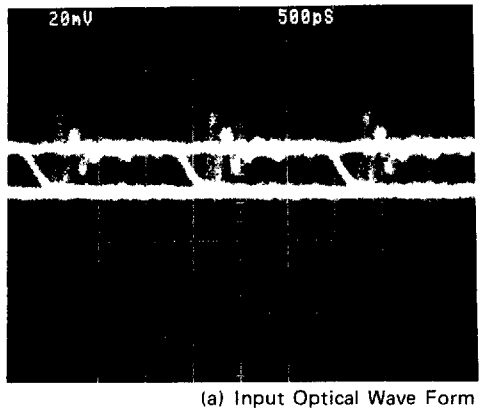
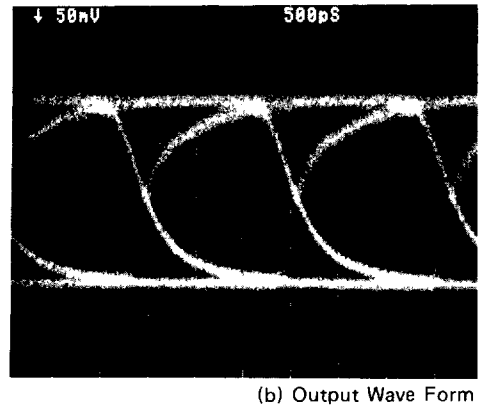


Fig. 5 Pulse Response



(a) Input Optical Wave Form

0 Level
680Mb/s
NRZ



(b) Output Wave Form

Fig. 6 Equivalent Input Noise Current Density

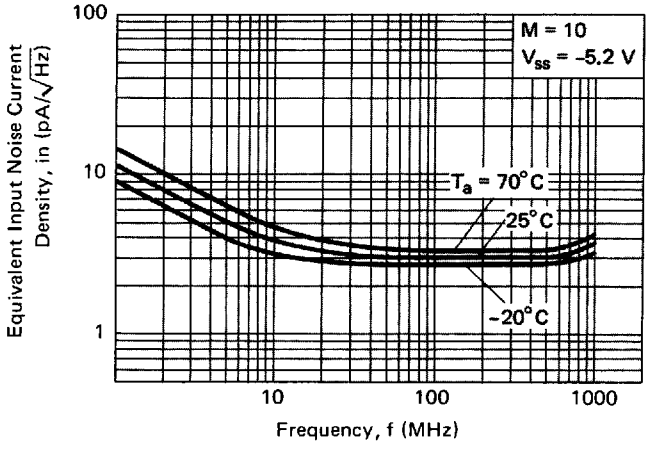


Fig. 7 Error Rate Characteristics