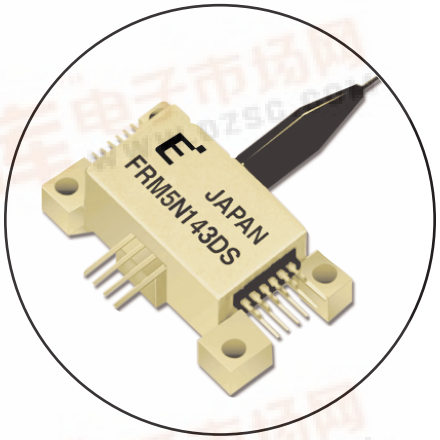
InGaAs-APD/Preamp Receiver

FRM5N143DS

FEATURES

- Integrated Design Optimizes Performance at High Bit Rates up to 10 Gb/s applications.
- -25 dBm Typical Sensitivity
- -7 dBm Overload Power (typ.)
- 27 dB Optical Return Loss (ORL)
- Integral Thermistor
- Simplifies Receiver Circuit Design
- Integrated HBT IC preamp



APPLICATIONS

This 80GHz gain bandwidth product APD detector with HBT preamp is intended to function as an optical receiver for DWDM, SONET, SDH optical fiber systems operating at 10Gb/s. This detector operates at both 1310 and 1550nm. The nominal 10kΩ integral thermistor allows accurate monitoring of the APD temperature and facilitates the design of the APD bias control circuit. It has a typical transimpedance (Zt) value of 1100Ω The detector preamplifier is DC coupled and has a differential electrical output.

DESCRIPTION

The FRM5N143DS incorporates a high bandwidth InGaAs APD photo diode, a GaAs HBT IC amplifier in a hermetically sealed butterfly type package. The APD is processed with modern MOVPE techniques resulting in reliable performance over a wide range of operating conditions. The lens coupling system and the single mode fiber are assembled using Nd YAG welding. It has differential output with DC coupling.

ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Parameter	Symbol	Ratings	Unit
Storage Temperature	T_{stg}	-40 to +85	°C
Operating Temperature	T_{op}	0 to +70	°C
Supply Voltage	V_{ss}	-6 to 0	V
APD Reverse Voltage	V_R	0 to VB (Note 1)	V
APD Reverse Current	I_R	1.0	mA

OPTICAL & ELECTRICAL CHARACTERISTICS (T_C=25°C, λ=1,550nm, V_{SS}=-5.2V, unless otherwise specified)

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
APD Responsivity	R15	1,550nm, M=1	0.65	0.7	-	A/W
APD Breakdown Voltage	V_B	ID=10μA	20	30	35	V
Temperature Coefficient of VB	Γ	(Note 2)	0.03	0.05	0.07	V/°C
AC Transimpedance	Z_t	RL=50Ω, f=130MHz,	800	1100	1400	Ω
Bandwidth	BW	RL=50Ω, M=9, -3dB from 130MHz, Pin = -20dBm	7.5	8.0	-	GHz
Sensitivity	P_r	NRZ, 10Gb/s, PRBS=2^{23}-1, B.E.R.=10^{-10}, VR is set at optimum value	-	-25	-24	dBm
Maximum Overload	P_o	NRZ, 10Gb/s, PRBS=2^{23}-1, B.E.R.=10^{-10}, M = 3	-8	-7	-	dBm
Optical Return Loss	ORL	-	27	-	-	dB
Power Supply Current	I_{ss}	-	-	110	130	mA
Power Supply Voltage	V_{ss}	-	-5.46	-5.2	-4.94	V
Thermistor Resistance	R_{tr}	Vss=0V	9.5	10	10.5	kΩ
Thermistor B Constant	B	Vss=0V	3,800	3,900	4,000	K

Note: (1) VB differs from device to device. VB data is attached to each devices.
(2) Γ=dVB/dTC

Fig. 1 Multiplication vs. Photocurrent

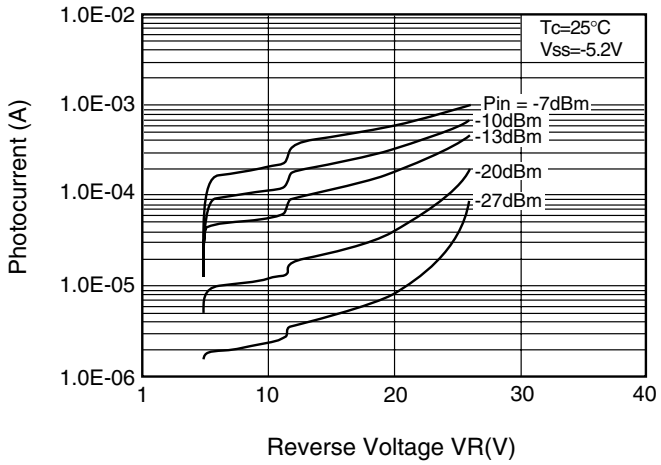


Fig. 2 Multiplication Characteristics

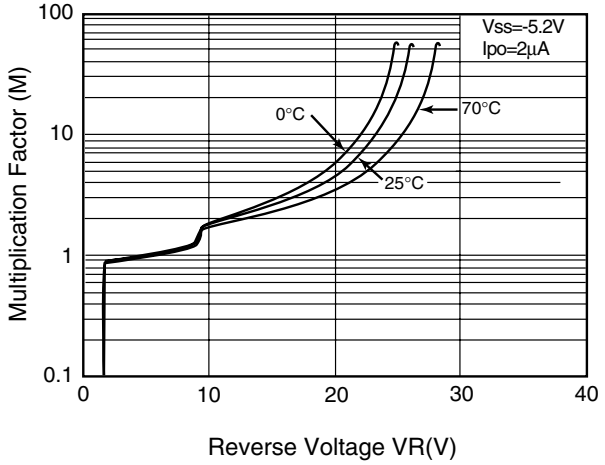


Fig. 3 Relative Frequency Response

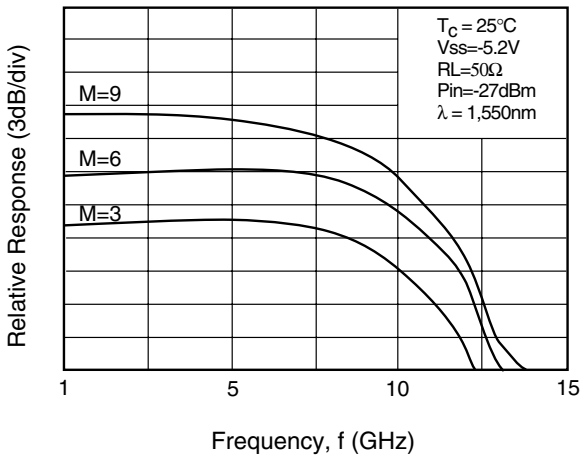


Fig. 4 Multiplication vs. Bandwidth

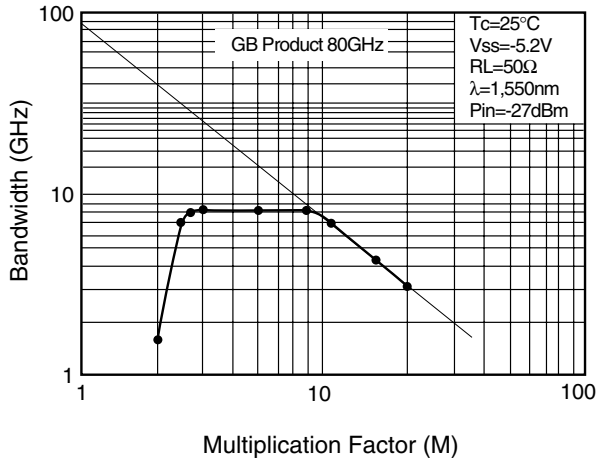


Fig. 5 Bit Error Rate

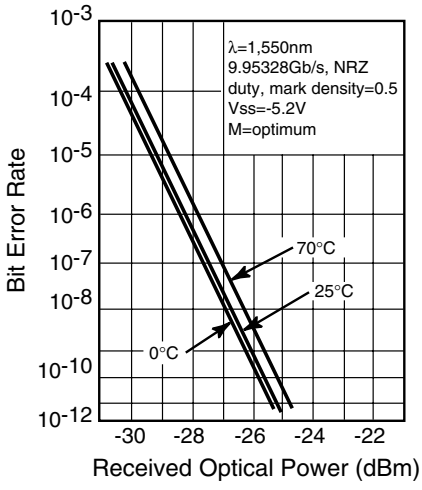


Fig. 6 Sensitivity vs. Multiplication Factor

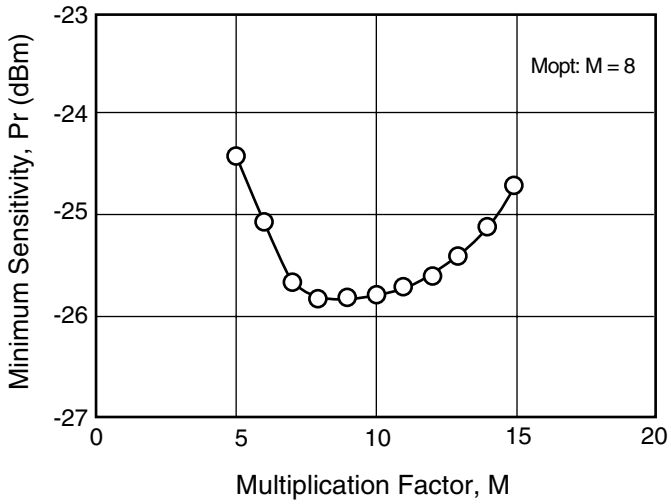


Fig. 7 Input Wave Form 1,550nm, 9.9532Gb/s NRZ, 2^{23}-1 PRBS, duty and mark density=0.5

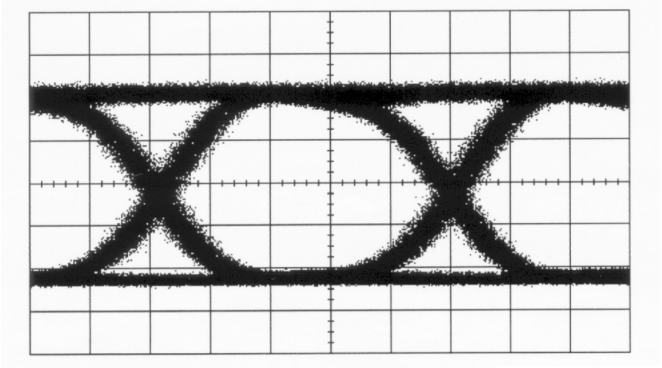


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Fig. 8 Output Wave Form Tc=25°C, RL=50Ω Pin=-26dBm, Vss=-5.2V, M=9

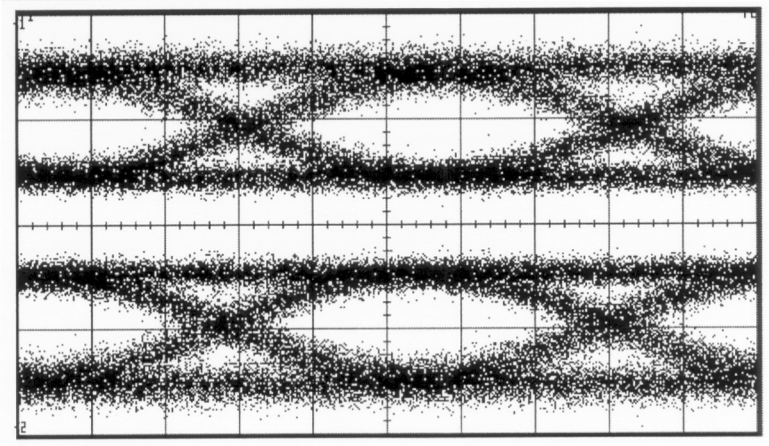

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Fig. 9 Output Wave Form Tc=25°C, RL=50Ω, Pin=-20dBm Vss=-5.2V, M=3

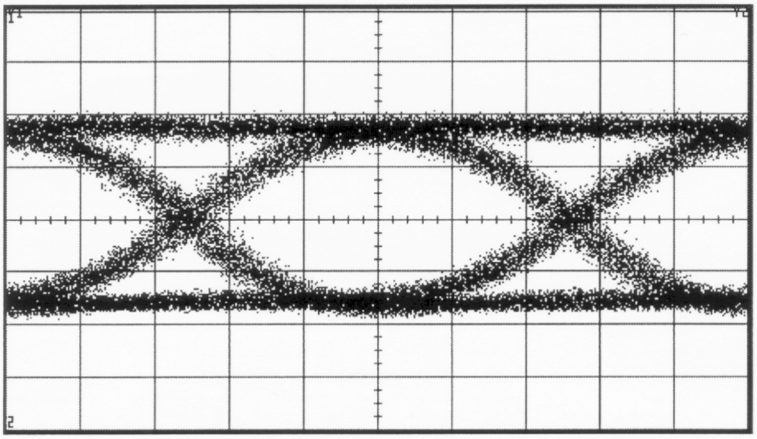

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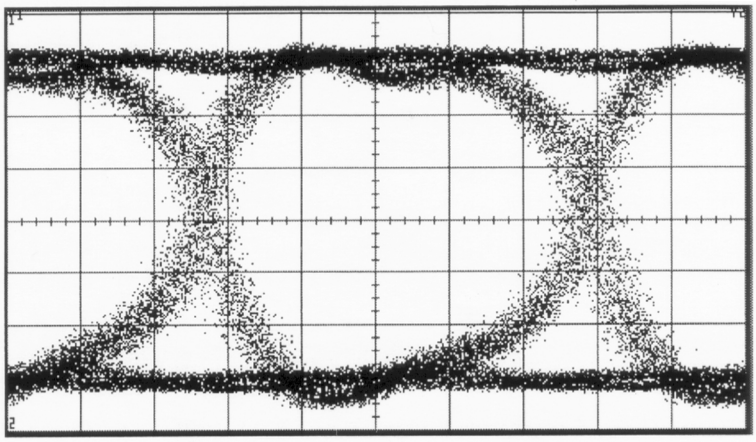
Fig. 10 Output Wave Form Tc=25°C, RL=50Ω, Pin=-7dBm, Vss=-5.2V, M=3



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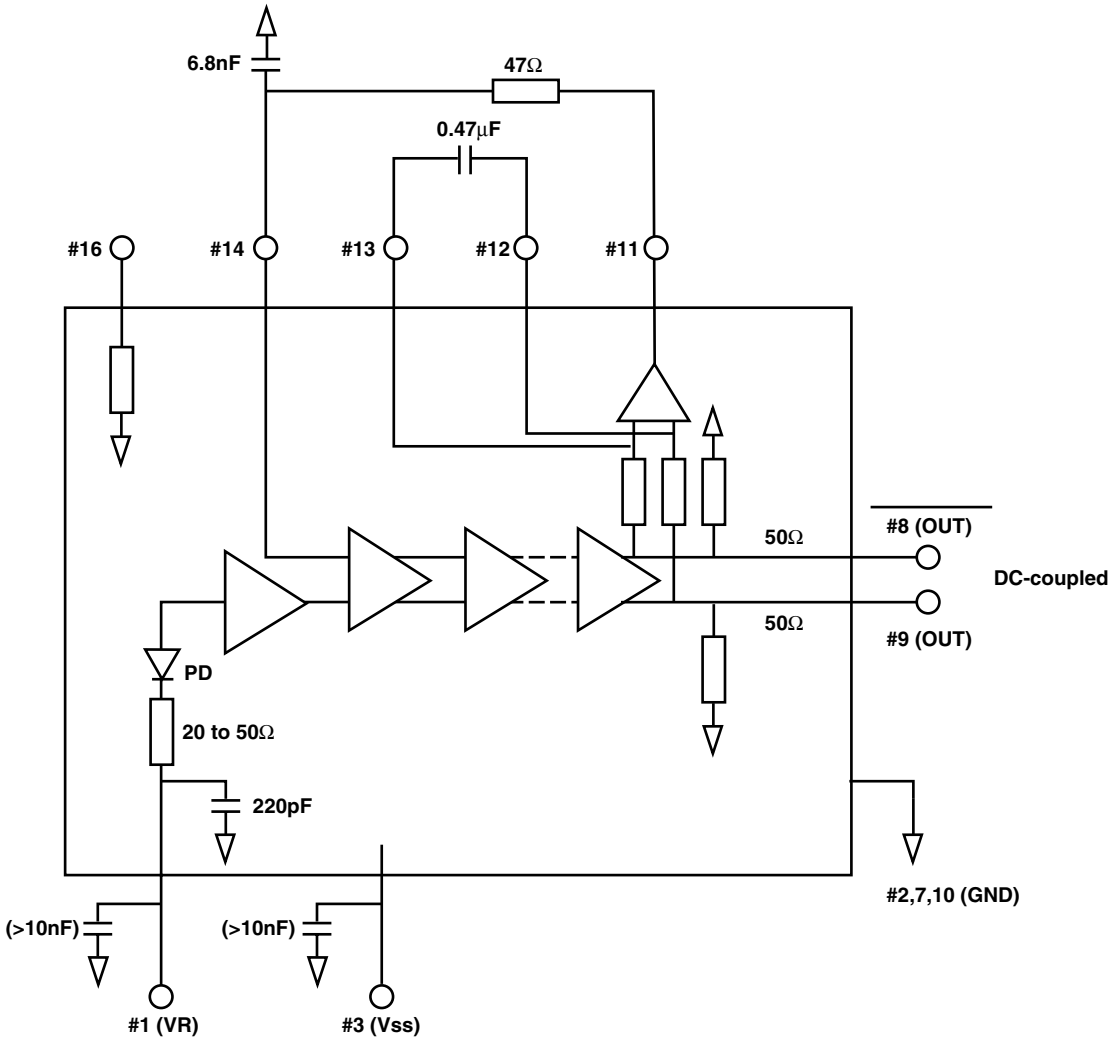
FRM5N143DS Recommended Circuit



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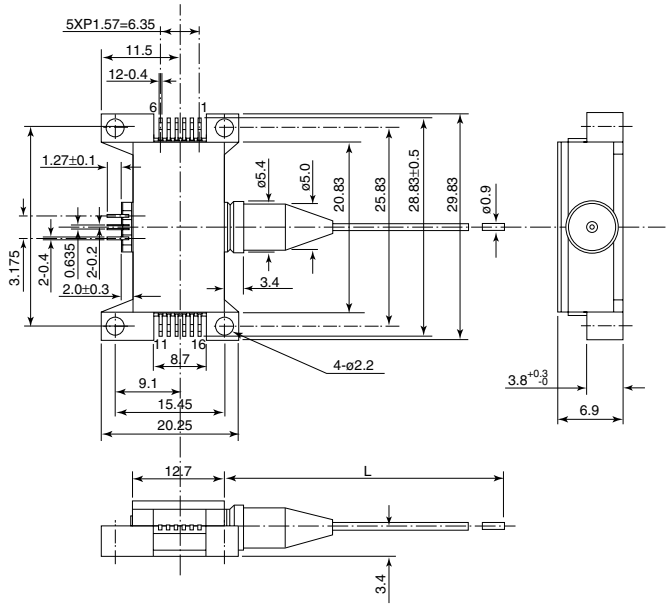
"DS" PACKAGE **UNIT: mm**



#	PIN DESIGNATIONS
1	PD Bias (+)
2	Case Ground
3	Power Supply For Preamp
4	NC
5	NC
6	NC
7	Case Ground
8	Output (-)
9	Output (+)
10	Case Ground
11	DC Feedback Out
12	Feedback 1
13	Feedback 2
14	DC Feedback In
15	NC
16	Thermistor For APD
	NC For Pin

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CAUTION

Eudyna Devices Inc. products contain **gallium arsenide (GaAs)** which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- **Do not put this product into the mouth.**
- **Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.**
- **Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.**