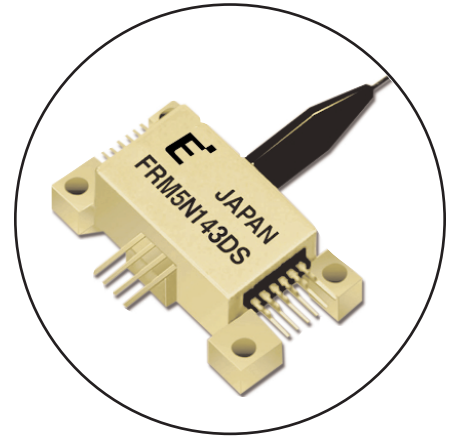


FEATURES

- 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 10k Ω integral thermistor allows accurate monitoring of the APD temperature and facilitates the design of the APD bias control circuit. It has a typical transimpedance (Z_t) value of 1100 Ω . 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 ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit
Storage Temperature	T_{stg}	-40 to +85	$^\circ\text{C}$
Operating Temperature	T_{op}	0 to +70	$^\circ\text{C}$
Supply Voltage	V_{SS}	-6 to 0	V
APD Reverse Voltage	V_{R}	0 to V_{B} (Note 1)	V
APD Reverse Current	I_{R}	1.0	mA

OPTICAL & ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, $\lambda=1,550\text{nm}$, $V_{\text{SS}}=-5.2\text{V}$, 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}	$I_{\text{D}}=10\mu\text{A}$	20	30	35	V
Temperature Coefficient of V_{B}	Γ	(Note 2)	0.03	0.05	0.07	$\text{V}/^\circ\text{C}$
AC Transimpedance	Z_{t}	$R_{\text{L}}=50\Omega$, $f=130\text{MHz}$,	800	1100	1400	Ω
Bandwidth	BW	$R_{\text{L}}=50\Omega$, M=9, -3dB from 130MHz, $P_{\text{in}} = -20\text{dBm}$	7.5	8.0	-	GHz
Sensitivity	P_{r}	NRZ, 10Gb/s, PRBS= $2^{23}-1$, B.E.R.= 10^{-10} , V_{R} 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}	$V_{\text{SS}}=0\text{V}$	9.5	10	10.5	$\text{k}\Omega$
Thermistor B Constant	B	$V_{\text{SS}}=0\text{V}$	3,800	3,900	4,000	K

Note: (1) V_{B} differs from device to device. V_{B} data is attached to each devices.

(2) $\Gamma=dV_{\text{B}}/dT_{\text{C}}$

Fig. 1 Multiplication vs. Photocurrent

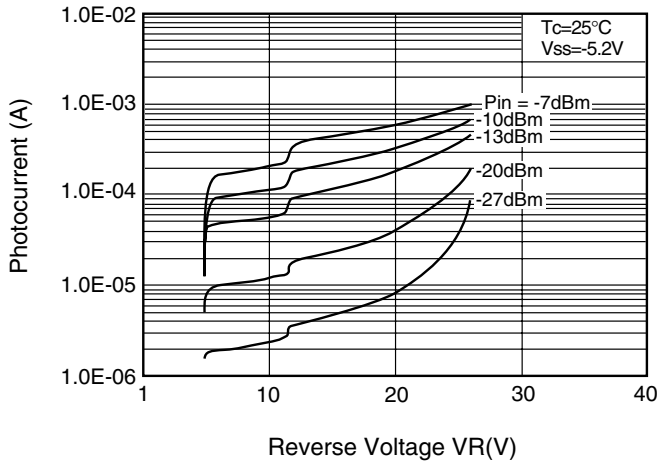


Fig. 2 Multiplication Characteristics

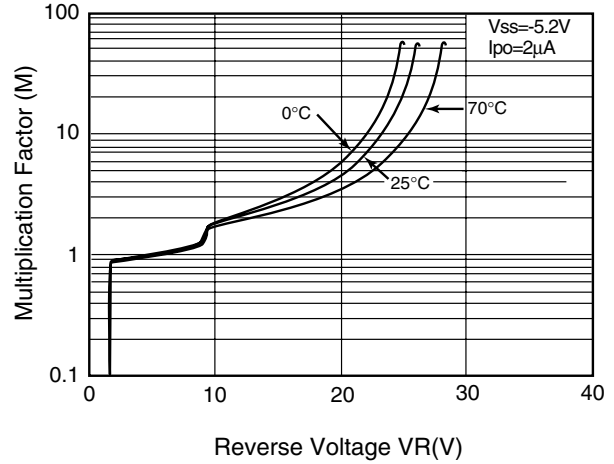


Fig. 3 Relative Frequency Response

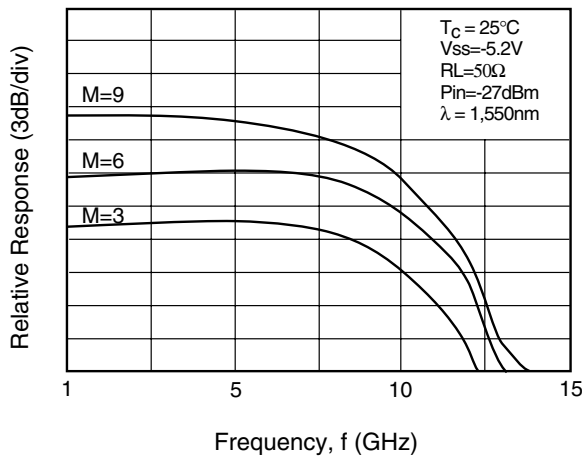


Fig. 4 Multiplication vs. Bandwidth

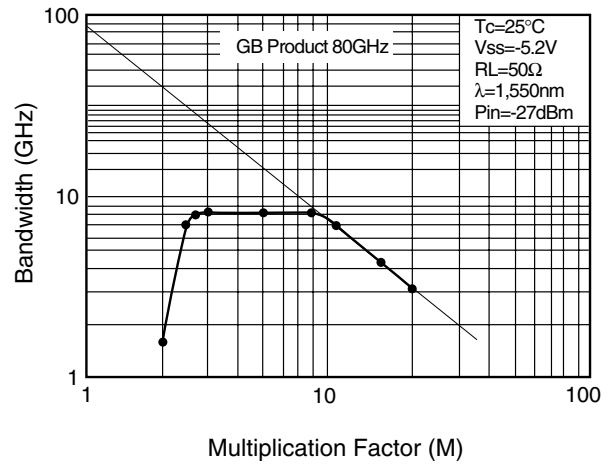


Fig. 5 Bit Error Rate

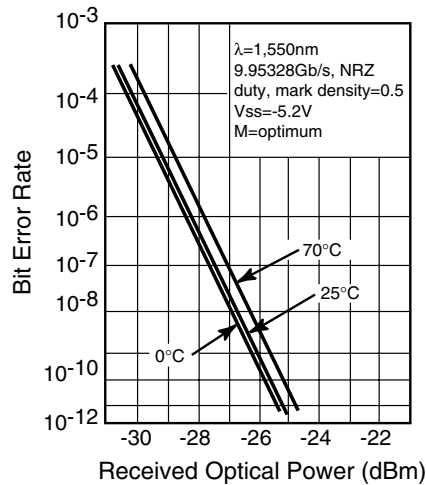


Fig. 6 Sensitivity vs. Multiplication Factor

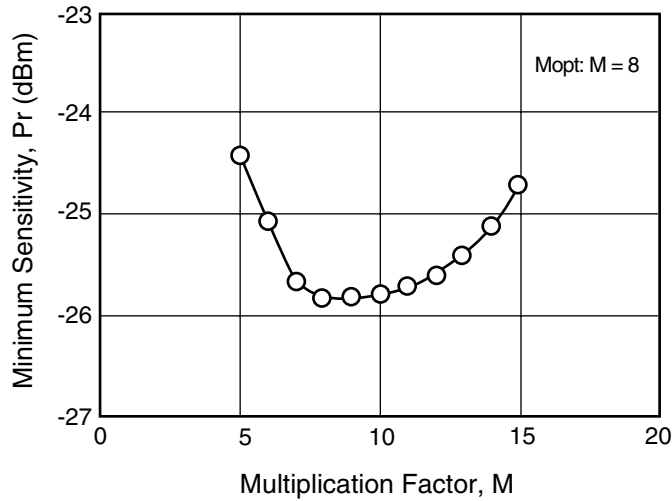


Fig. 7 Input Wave Form 1,550nm, 9.9532Gb/s NRZ, 2²³-1 PRBS, duty and mark density=0.5

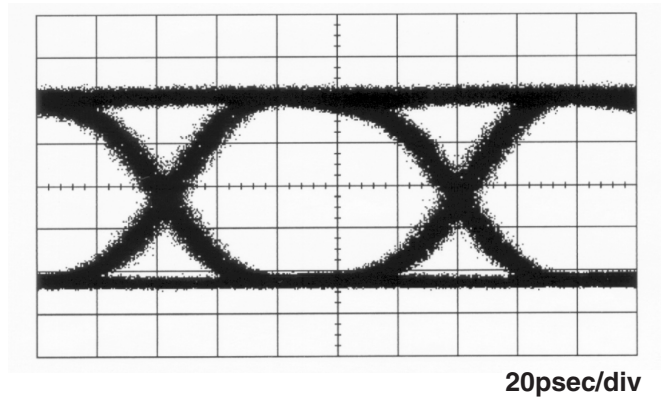
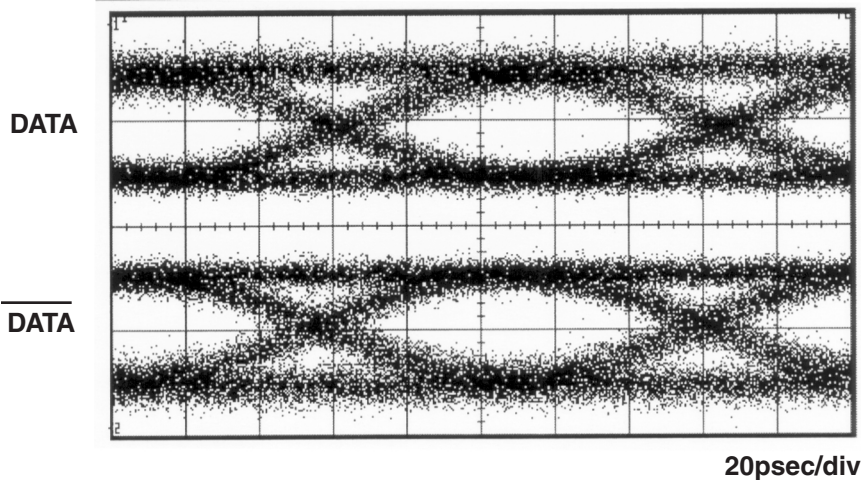
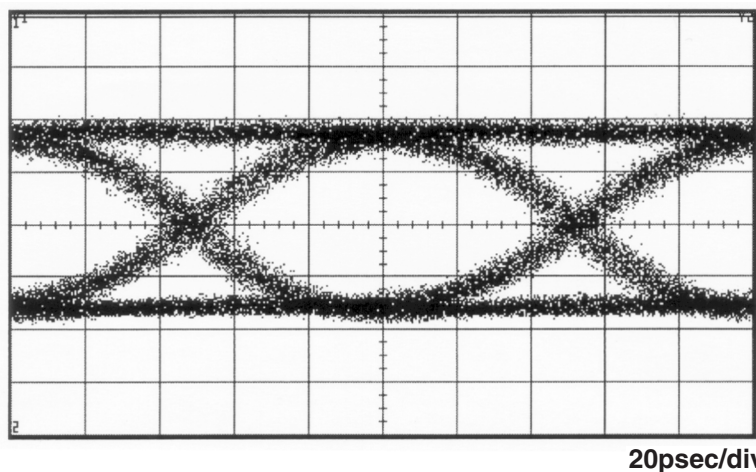


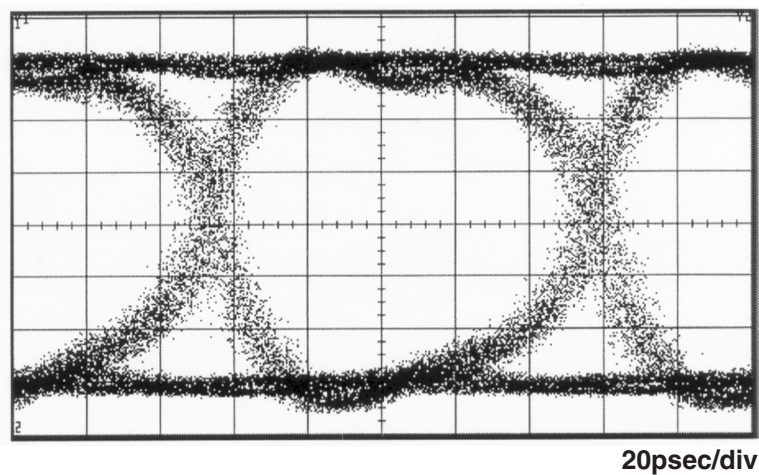
Fig. 8 Output Wave Form Tc=25°C, RL=50Ω Pin=-26dBm, Vss=-5.2V, M=9



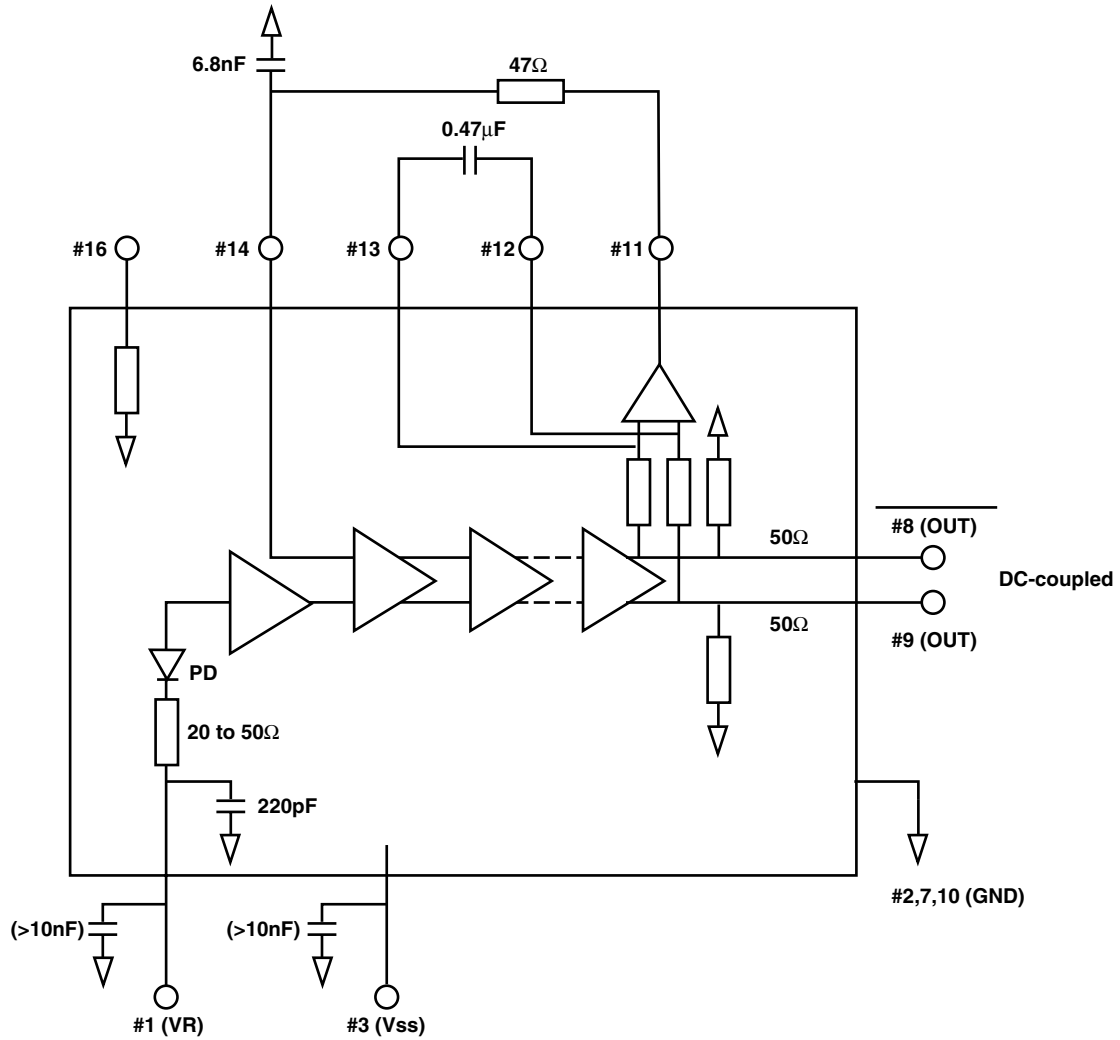
**Fig. 9 Output Wave Form $T_c=25^\circ\text{C}$, $R_L=50\Omega$, $P_{in}=-20\text{dBm}$
 $V_{ss}=-5.2\text{V}$, $M=3$**

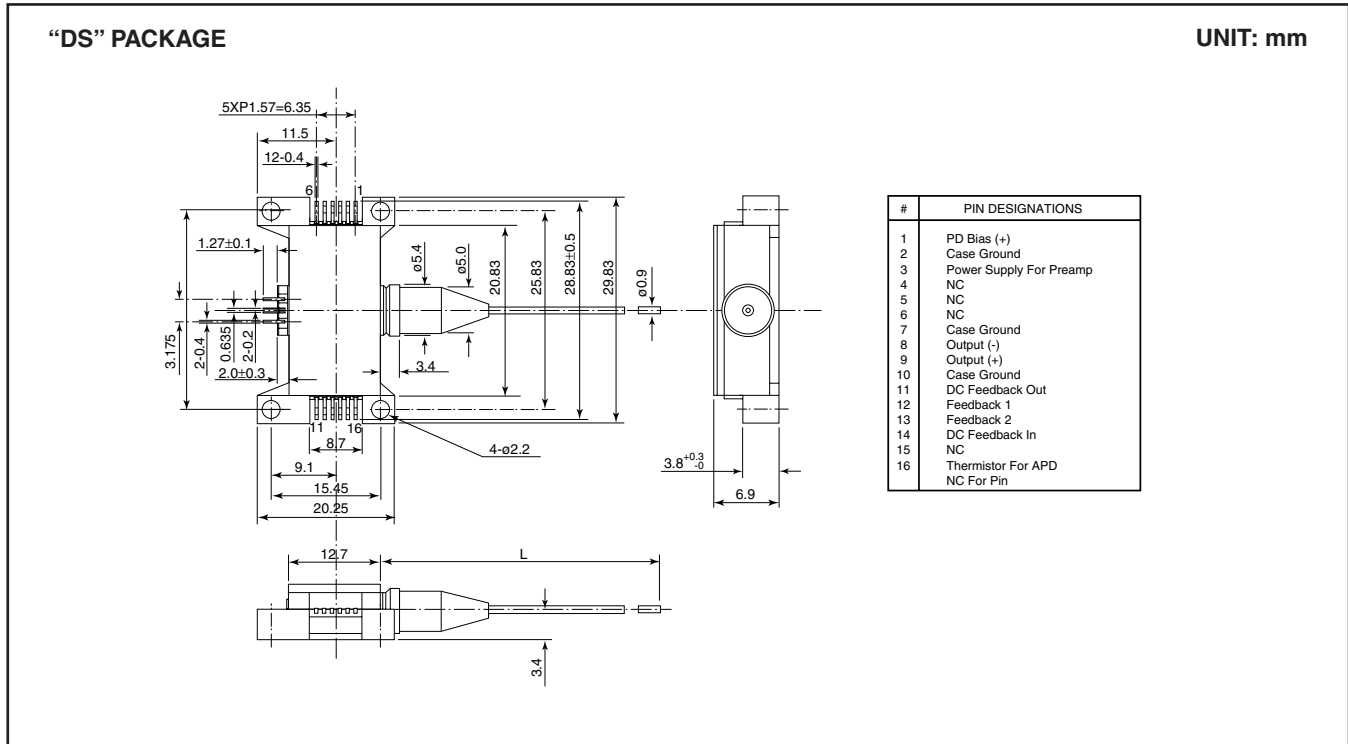


**Fig. 10 Output Wave Form $T_c=25^\circ\text{C}$, $R_L=50\Omega$,
 $P_{in}=-7\text{dBm}$, $V_{ss}=-5.2\text{V}$, $M=3$**



FRM5N143DS Recommended Circuit





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