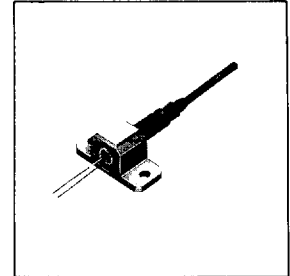


# FPD15W51JW

# InGaAs AVALANCHE PHOTODIODE

## DESCRIPTION

The FPD15W51JW is a wide bandwidth and high sensitivity InGaAs avalanche photodiode (APD) with a multimode fiber pigtail designed for use in optical transmission systems operating at a giga-bit-rate, especially at 2.4Gb/s, and a long distance. The APD chip has a photosensitive area diameter of 50 $\mu$ m. Fujitsu's advanced InGaAs/InP material technology realizes a high reliability planar structure device with wide bandwidth (large gain-bandwidth product) as well as low noise characteristics. A multi-mode fiber is aligned to a hermetically sealed APD through a lens and the optical alignment system has a high coupling stability. The device is designated by the specified wavelength of 1550nm.



## FEATURES

- Multi-mode fiber pigtail. GI 50/125 (core diameter 50 $\pm$ 3 $\mu$ m, cladding diameter 125 $\pm$ 3 $\mu$ m)
- Photosensitive diameter: 50 $\mu$ m
- High cut-off frequency: 3.0GHz at M=5 and 10
- Large gain-bandwidth product: 40GHz
- Low dark current: 20nA
- Low multiplied dark current: 3nA
- Low excess noise factor: 5 at M=10
- High reliability planar structure with a guard ring based on advanced InGaAs/InP material technology.

## APPLICATIONS

- 2.4Gb/s optical transmission system.

## ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = 25°C)

Parameter	Symbol	Ratings	Unit
Storage Temperature	T <sub>stg</sub>	-20 to +70	°C
Operating Temperature	T <sub>op</sub>	-10 to +60	°C
Forward Current	I <sub>F</sub>	10	mA
Reverse Current	I <sub>R</sub>	0.5	mA

## OPTICAL AND ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25°C)

Parameter	Symbol	Test Conditions	Limits			Unit	
			Min.	Typ.	Max.		
Quantum Efficiency (Responsivity)	$\eta$ (R)	$\lambda = 1550\text{nm}$ M = 1	65 (0.81)	70 (0.88)	—	% (A/W)	
Breakdown Voltage	V <sub>B</sub>	I <sub>D</sub> = 10 $\mu$ A	60	80	100	V	
Temperature Coefficient of V <sub>B</sub>	$\gamma$		—	0.15	—	%/°C	
Dark Current	I <sub>D</sub>	V <sub>R</sub> = 0.9V <sub>B</sub>	—	20	50	nA	
Multiplied Dark Current	I <sub>DM</sub>	M = 1	—	3	10	nA	
Excess Noise Factor	F	$\lambda = 1550\text{nm}$ , M = 10 f = 30MHz, B = 1MHz I <sub>po</sub> = 2 $\mu$ A	—	5	6.3	—	
	X		—	0.7	0.8	—	
Cut-off Frequency	f <sub>c</sub>	$\lambda = 1550\text{nm}$ , R <sub>L</sub> = 50 $\Omega$ , -3dB from 500KHz	M=5	2.5	3.0	—	GHz
			M=10	2.5	3.0	—	
			M=20	1.5	2.0	—	
Capacitance	C <sub>t</sub>	f = 1MHz, V <sub>R</sub> = 0.9V <sub>B</sub>	—	0.7	0.8	pF	
Max. Multiplication Factor	M <sub>max</sub>	$\lambda = 1550\text{nm}$ , I <sub>po</sub> = 2 $\mu$ A	30	40	—	—	

# FPD15W51JW

## TYPICAL CHARACTERISTICS

Fig. 1 Spectral Response ( $\eta$  vs.  $\lambda$ )

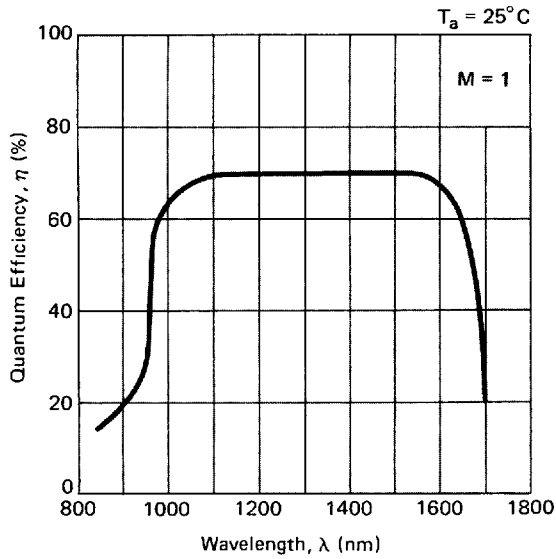


Fig. 2 Spectral Response ( $R$  vs.  $\lambda$ )

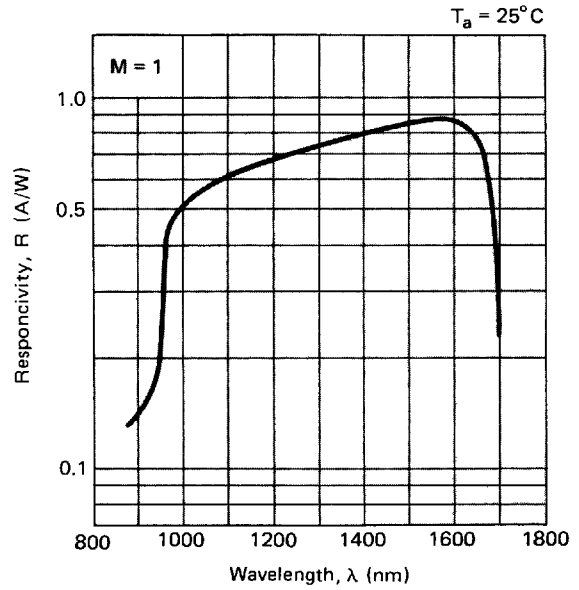


Fig. 3 Temperature Dependence of Responsivity

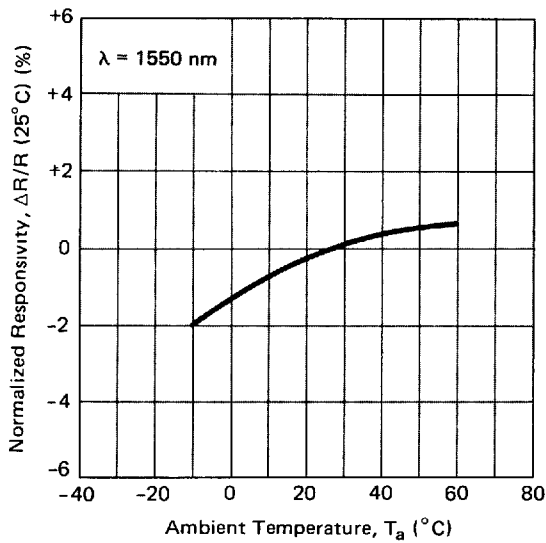
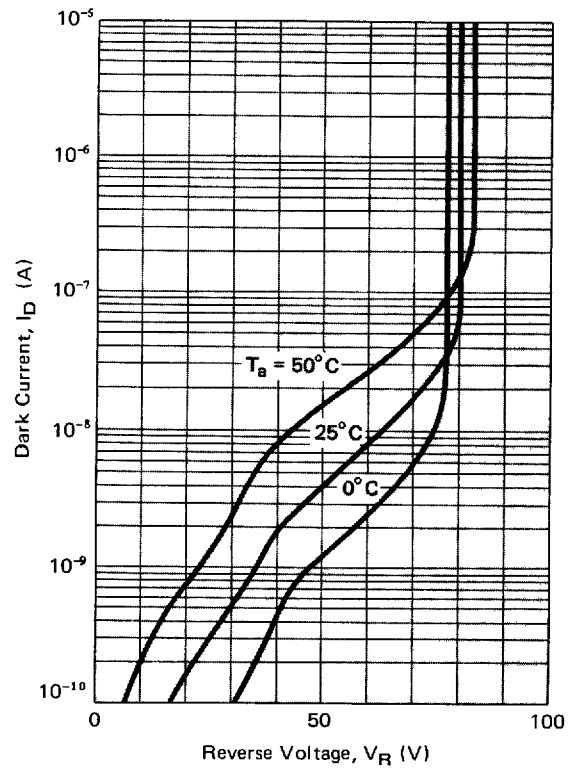


Fig. 4 Dark current vs. Reverse Voltage



# InGaAs AVALANCHE PHOTODIODE

Fig. 5 Temperature Dependence of Dark Current and Multiplied Dark Current

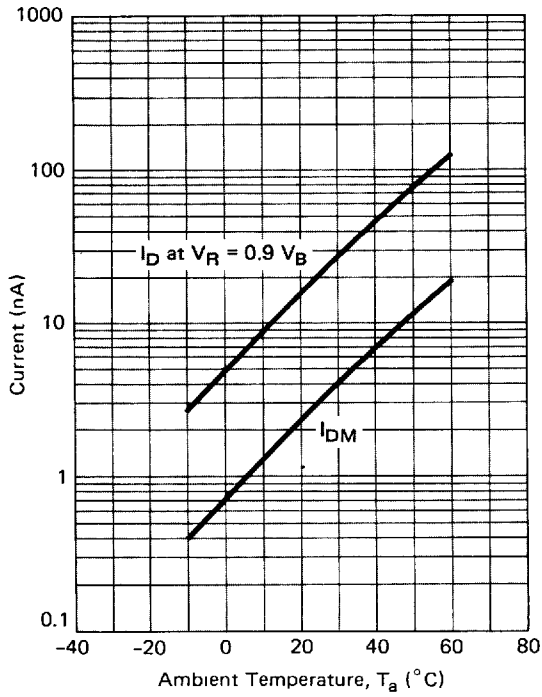


Fig. 6 Multiplication Characteristics

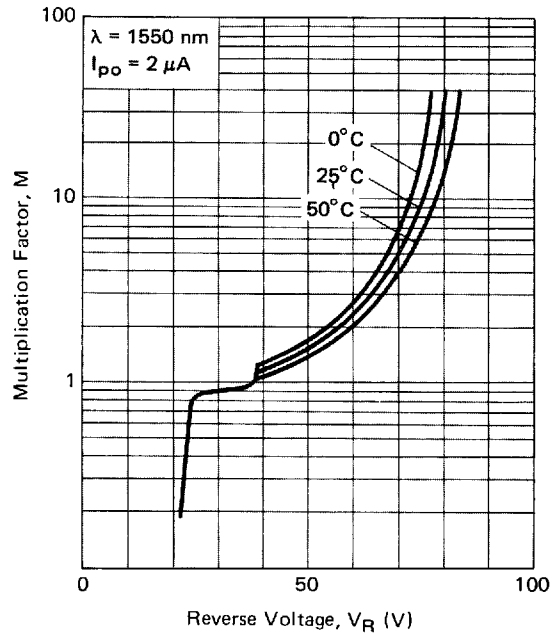


Fig. 7 Multiplication Factor vs. Photocurrent

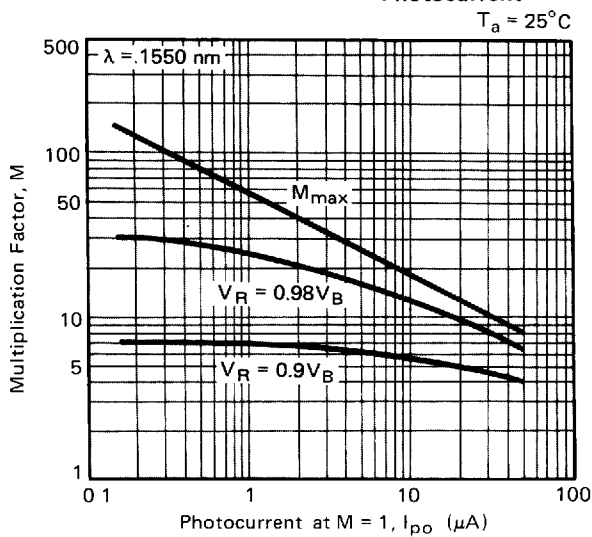
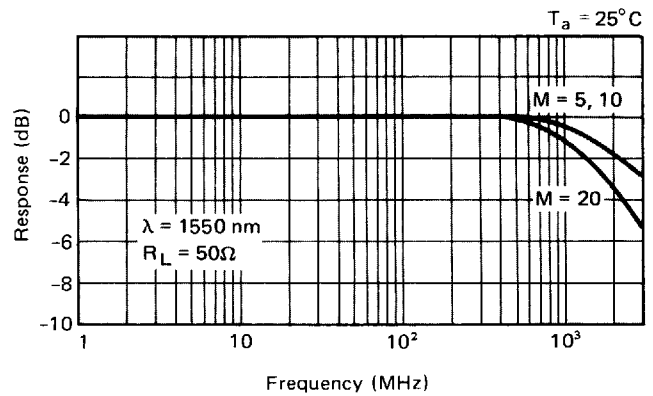
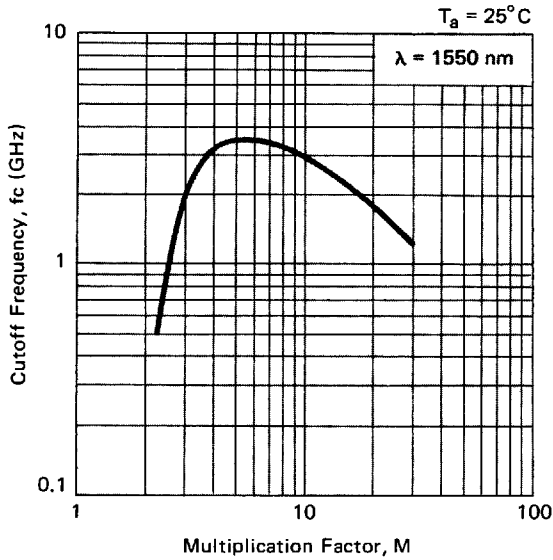


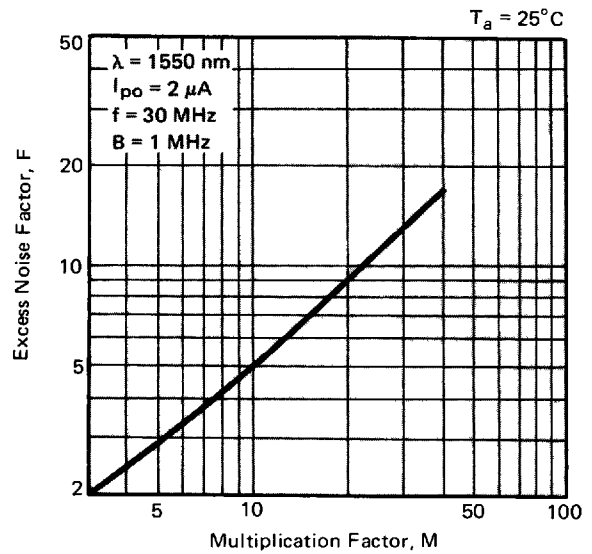
Fig. 8 Frequency Response



**Fig. 9 Cutoff Frequency vs. Multiplication Factor**



**Fig. 10 Excess Noise Factor vs. Multiplication Factor**



**Fig. 11 Capacitance vs. Reverse Voltage**

