

# Pigtailed High-Gain Low-Noise InGaAs APD



CMC Electronics' 276-339767-VAR is a pigtailed InGaAs APD Series available in 30  $\mu\text{m}$  (single mode fiber, SMF) and 80  $\mu\text{m}$  (multimode fiber, MMF) active area variants, both with very high operating gain above  $M = 100$ , very low k-factor ( $k$ ), and Excess Noise Figure ( $F$ ).

Based on an industry-proven design, the 276-339767 Series InGaAs APDs have a high Quantum Efficiency (QE) over the wavelength range of 950 to 1600 nm.

A high dynamic range is maintained even at high operating temperatures, reducing the need for cooling.

Customizations such as optical return loss tuning or responsivity screening are available upon request.

## Features

- Active area from 30 – 80  $\mu\text{m}$
- Low k-factor InGaAs APD
- Low Excess Noise Factor ( $F$ )
- Low Noise Equivalent Power (NEP)
- High dynamic range
  - $\Delta V \approx 8 \text{ V}$  ( $M = 10$ )
  - $\Delta V \approx 4 \text{ V}$  ( $M = 45$ )
  - $\Delta V \approx 1 \text{ V}$  ( $M = 100$ )
- Wide Operating Temp Range
- Typical coupling efficiency:  $> 90 \%$
- Low Optical Return Loss (ORL)
- FC/APC and other connectors available upon request

## Applications

- Optical Time-Domain Reflectometry (OTDR)
- LiDAR and Laser Range Finding (LRF)
- Distributed Fiber Optic Sensing (DFOS)
- Distributed Temperature Sensing (DTS)
- Distributed Acoustic Sensing (DAS)

**Table 1. Electro-Optical Characteristics**

Conditions:  $T_A = 25^\circ\text{C}$ ,  $M = 10$  unless otherwise specified

276-369767-002  
MULTIMODE FIBER 80  $\mu\text{m}$

Parameter	Symbol	Min	Typical	Max	Units
Breakdown Voltage	$V_{BR}$	45	60	80	V
Operating point from Breakdown Voltage ( $V_{BR} - V_{OP}$ )	$\Delta V$	7	8	9	V
Temperature Coefficient of $V_{OP}$	$\Delta V/\Delta T$		0.06		V/ $^\circ\text{C}$
Dark current	$I_d$		2	10	nA
Quantum Efficiency (1064-1550 nm)	QE	75	83		%
Responsivity at 1550 nm	R	8.5	9.0		A/W
Capacitance	$C_d$		0.55	0.6	pF
Spectral Noise Current	$i_n$		0.18		$\text{pA}/\sqrt{\text{Hz}}$
Excess Noise Factor	F		3.2		
Bandwidth	$f_{-3\text{dB}}$		5.8		GHz
Recommended Operating Gain (Note 1)	M	10	65	100	
Operating Temperature	$T_A$	-45		+85	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-45		+85	$^\circ\text{C}$
Optical Return Loss	ORL		-25		dB

276-369767-004  
SINGLE MODE FIBER 30  $\mu\text{m}$

Parameter	Symbol	Min	Typical	Max	Units
Breakdown Voltage	$V_{BR}$	45	60	80	V
Operating point from Breakdown Voltage ( $V_{BR} - V_{OP}$ )	$\Delta V$	7	8	9	V
Temperature Coefficient of $V_{OP}$	$\Delta V/\Delta T$		0.06		V/ $^\circ\text{C}$
Dark current	$I_d$		0.25	0.5	nA
Quantum Efficiency (1064-1550 nm)	QE	75	83		%
Responsivity at 1550 nm	R	8.5	9.0		A/W
Capacitance	$C_d$		0.45		pF
Spectral Noise Current	$i_n$		0.045		$\text{pA}/\sqrt{\text{Hz}}$
Excess Noise Factor	F		3.2		
Bandwidth	$f_{-3\text{dB}}$		6.5		GHz
Recommended Operating Gain (Note 1)	M	10	65	100	
Operating Temperature	$T_A$	-45		+85	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-45		+85	$^\circ\text{C}$
Optical Return Loss	ORL		-35		dB

**Note:** 1. Noise increases with gain and depends on bulk and surface currents.

**Table 2. Absolute-Maximum Ratings, Limiting Values**

Parameter	Symbol	Max.	Units
Forward Current	$I_F$	10	mA
Reverse Current	$I_R$	1	mA
Total Power Dissipation	$P_{\text{TOT}}$	20	mW
Soldering Temperature (5 seconds, leads only)		260	$^\circ\text{C}$

Figure 1. Typical Quantum Efficiency

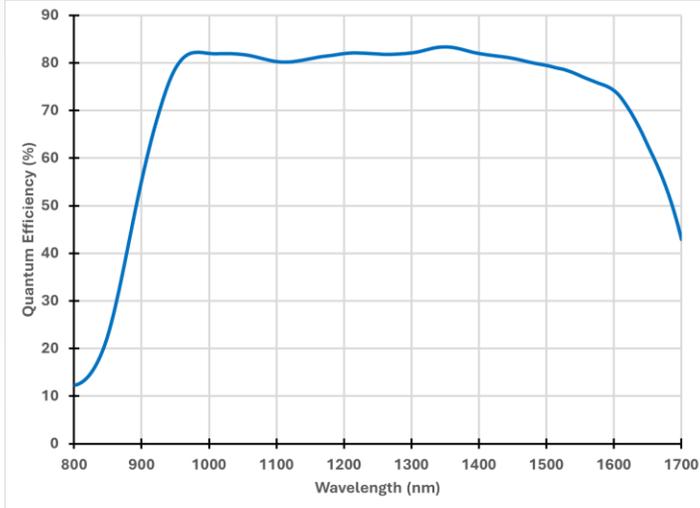


Figure 2. Typical Normalized Responsivity (M=1)

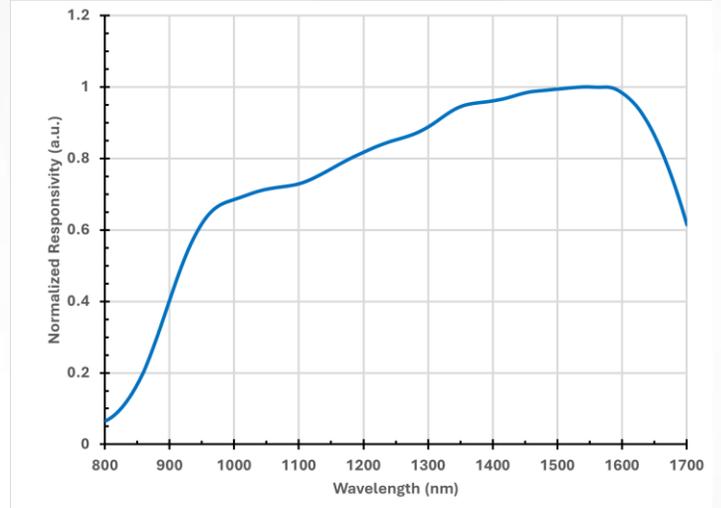
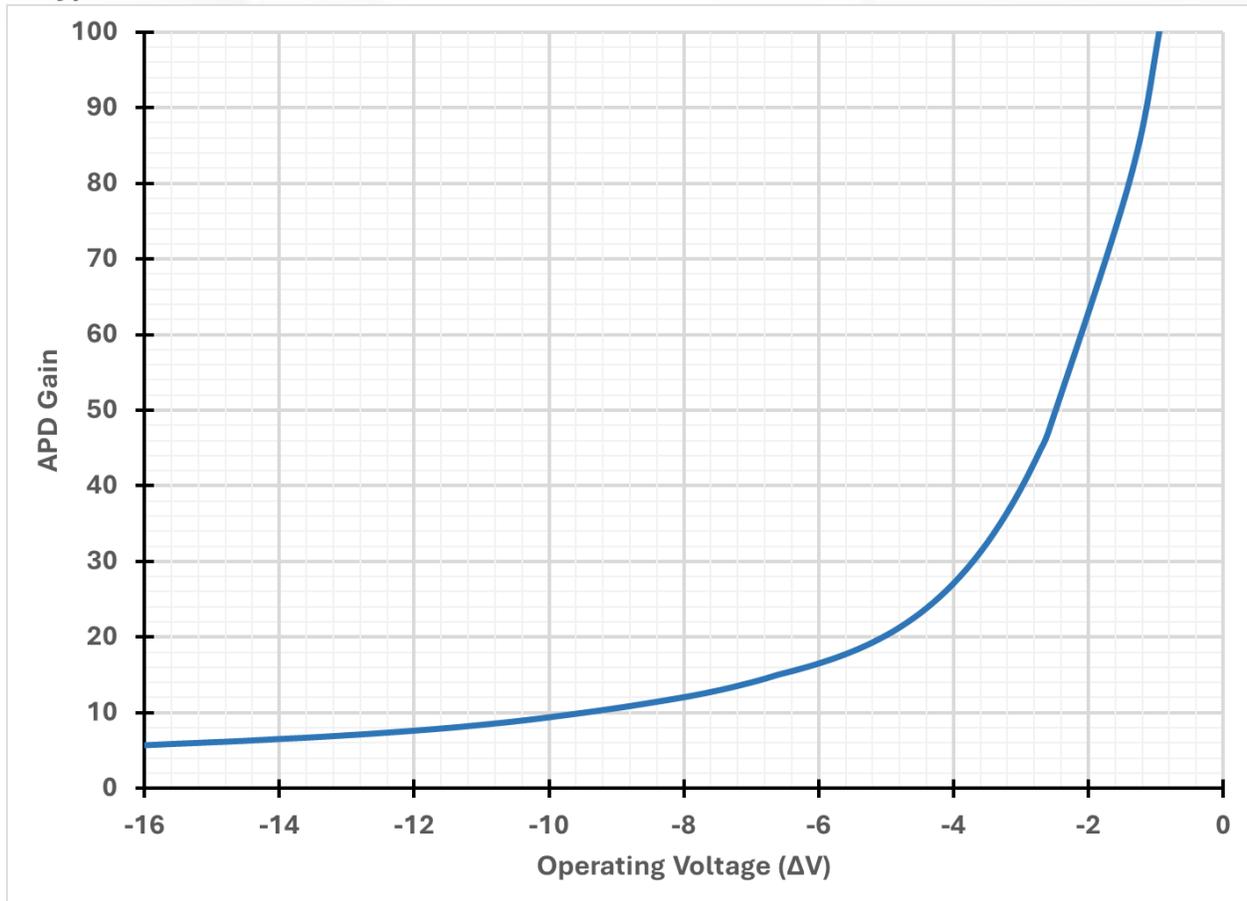


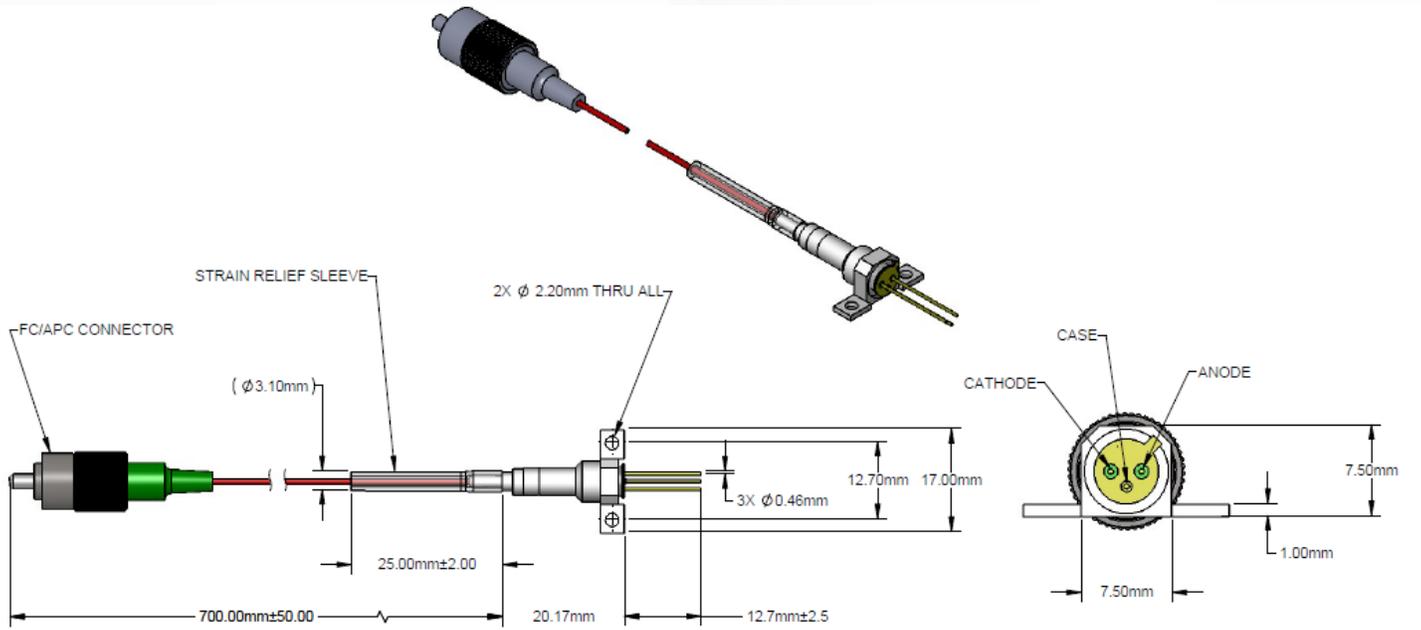
Figure 3. Typical APD Gain



276-339767 Series  
Pigtailed InGaAs Avalanche Photodiodes

**Figure 4. 276-339767 Package Dimension and Pinout**

Unless otherwise specified, dimensions are in mm and are for reference only. Standard fiber length = 700 mm. Connector options available upon request



**VAR Options**

VAR	APD Diameter	276-339767-VAR
-002	80 μm	Fiber Pigtail 62.5 μm MMF
-004	30 μm	Fiber Pigtail 9 μm SMF



For more information, visit [www.cmcelectronics.ca/optoelectronics](http://www.cmcelectronics.ca/optoelectronics) or email us at [opto@cmcelectronics.ca](mailto:opto@cmcelectronics.ca)

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