High Bandwidth InGaAs APD Preamplifier Module



CMC Electronics' 264-339834 series uses an InGaAs APD with a low k-factor of 0.2, with a built-in preamplifier enabling optimum signal-to-noise performance.

The APD is coupled to a GaAs FET input transimpedance amplifier (TIA) in a 12-lead TO-8 package. The internal temperature can be monitored via an embedded thermal sensor close to the APD.

The module is designed with a 50 Ω output impedance which can be AC- or DC-coupled and can sustain high optical power exposure with a very fast recovery time with its integrated overload input protection circuit.

Customizations such as bandwidth tuning, NEP screening, responsivity optimization and different temperature sensors are available upon request. Optional fiber-receptacle to ease coupling is also available.

Features

- Active area diameter of 80 µm
- 500 MHz Preamplifier Module
- Spectral Response: 900 – 1700 nm
- Low k-factor of 0.2 InGaAs APD
- Low Noise Equivalent Power (NEP)
- High Sensitivity
- Hermetically Sealed TO-8 Package
- RoHS-compliant
- Optional: Fiber-receptacle (617-prefix)

Applications

- Full-Waveform LiDAR
- Free-Space Communications
- Decoding
- Laser Microscopy
- Imaging Systems
- Industrial (Safety curtains)

Table 1. Electro-Optical Characteristics for 80 µm Active Area (-001)

Unless otherwise specified: T_{case} = 25°C, V_POS = 5.0 V, V_NEG = -5.0 V, R_L = 50 Ω, λ = 1570 nm ± 10 nm, (Externally AC-coupled through 4.7 µF)

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Voltage, V_{OP} (Note 1)	V_{op}	40	54	85	V
Temperature coefficient of V_{OP}	ΔV/ΔT		0.07		V/°C
Responsivity	R		400		kV/W
Output impedance	R_{out}		50		Ω
Noise equivalent power (Note 2)	NEP				
1570 nm [T_{case}=25 °C]			65		fW/√Hz
1570 nm [T_{case}=85 °C]			125		fW/√Hz
Bandwidth	f_{-3dB}	450	500		MHz
Rise time (10-90 %) & Fall time (90-10%)	t_r & t_f		0.7		ns
Linear output voltage swing (Pulse)		0.75	1.25	2	V
Output offset voltage	V_{oo}	-0.75	-0.45	0	V
Thermal sensor (1N914 diode) (Note 3)					
I_f of 5 mA at 25°C	V_{Tsens}		645		mV
Sensor sensitivity			-1.9		mV/°C
Overload recovery for optical power input signal of 1 mW, 20 ns pulse width:					
V_{out} → 200 ns after pulse start				125	mV
V_{out} → 1 µs after pulse start				20	mV
Hybrid Supply current V_POS (pin 12)		25		35	mA
V_NEG (pin 3)		-20		-10	mA

Notes:
1. Each APD receiver will have its individual V_{OP} (provided on its production test report).
2. Integration of the noise calculation is based on f_{-3dB} bandwidth. NEP values for +85°C are by design and are for reference only. No test values are provided on individual test reports. Integration of the noise calculation is based on minimum bandwidth.
3. Alternate thermal sensors (IC sensors or thermistors) are available upon request.

Table 2. Absolute-Maximum Ratings, Limiting Values

Parameter	Symbol	Min.	Max.	Units
APD breakdown, Maximum voltage [HV_POS (pin 4)] (Note 1)	V_{BR}		90	V
Recommended overcurrent limit			100	µA
Input Voltage Positive Supply [V_POS (+5V) (pin 12)]		+4.8	+6.0	V
Input Voltage Negative Supply [V_NEG (-5V) (pin 3)]		-4.8	-6.0	V
Maximum Optical Power, CW			10	µW
Peak value, 20 ns pulses < 100 Hz			100	kW/cm²
Temperature sensor fixed input current between				
Sensor V_{in} → TSensor ANODE (pin 8)		1	10	mA
Sensor output → TSensor CATHODE (pin 9)	V_{Tsens}			
Operating Temperature	T_{oper}	-40	85	°C
Storage Temperature	T_{store}	-55	125	°C
Soldering Temperature (5 s, leads only)	T_{solder}		250	°C

Note: 1. Absolute maximum over the product Temperature Operating Range (-40°C to +85°C).

Figure 1. Typical Normalized Responsivity (M=1)

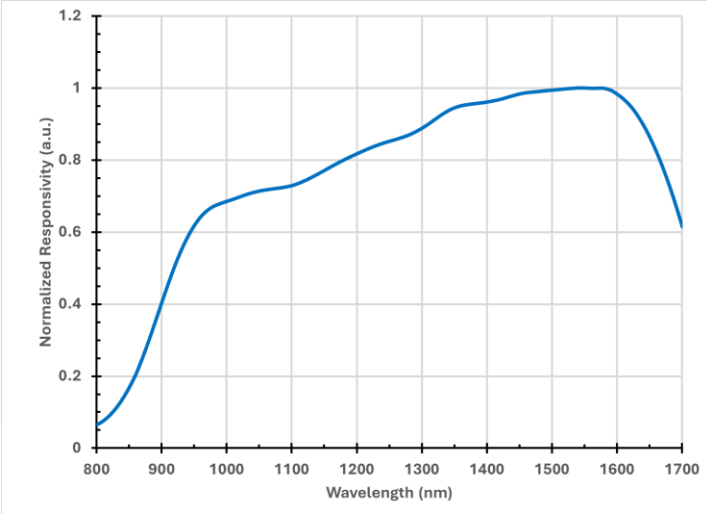


Figure 2. Normalized Frequency Response (-001)

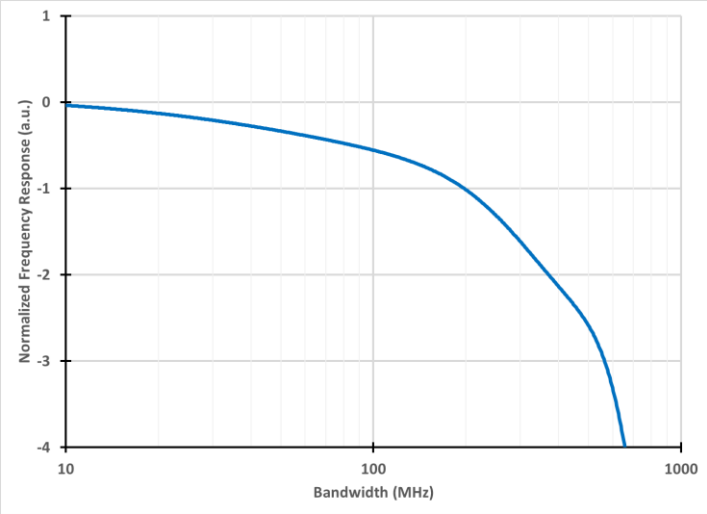


Figure 3. Typical Responsivity (-001)

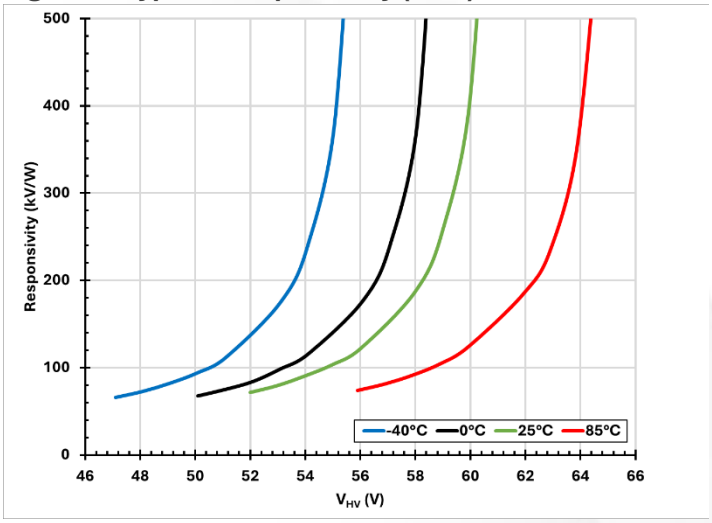


Figure 4. Typical NEP (-001)

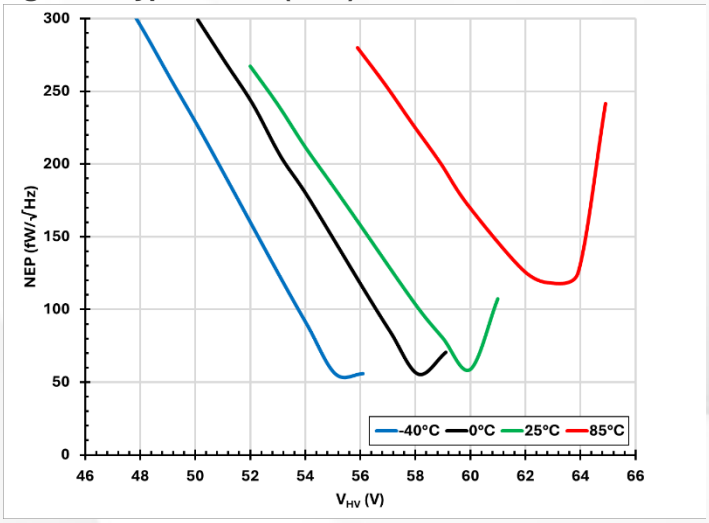


Figure 5. CMC 264-339834 Series block diagram

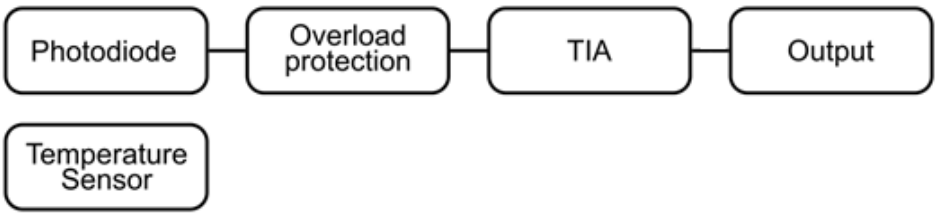
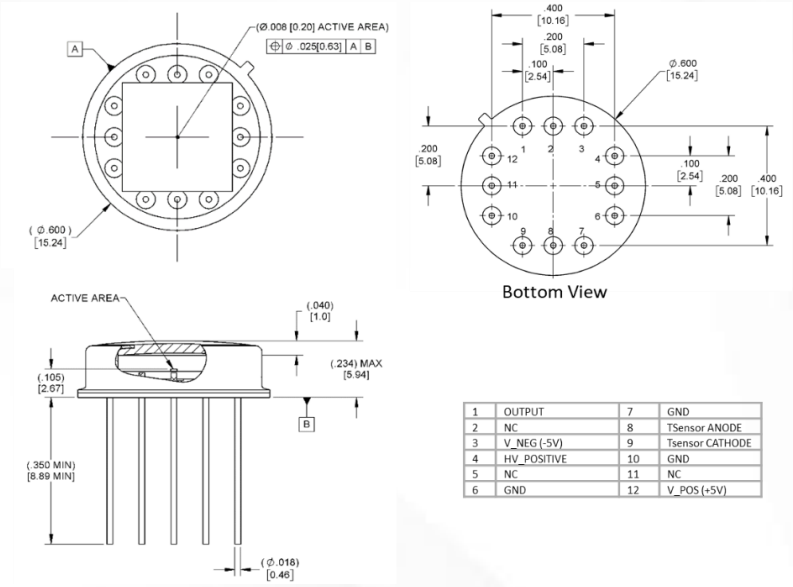
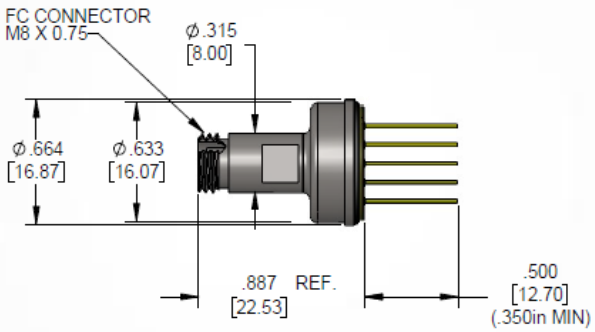


Figure 6. Package Dimensions and Pinout



1	OUTPUT	7	GND
2	NC	8	TSensor ANODE
3	V_NEG (-5V)	9	Tsensor CATHODE
4	HV_POSITIVE	10	GND
5	NC	11	NC
6	GND	12	V_POS (+5V)

Figure 7. FC-receptacle Dimensions



Unless otherwise specified, dimensions are in inches [mm] and are for reference only.

Table 3. Ordering Guide

Part Number	Active Diameter	Typical Bandwidth	Comments
264-339834-001	80 µm	500 MHz	
617-339834-001			with FC-receptacle

Evaluation Board: CMC PN: 245-337801-002 available

For more information, visit www.cmcelectronics.ca/optoelectronics
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