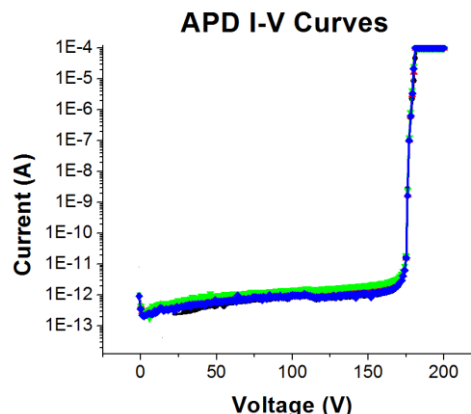
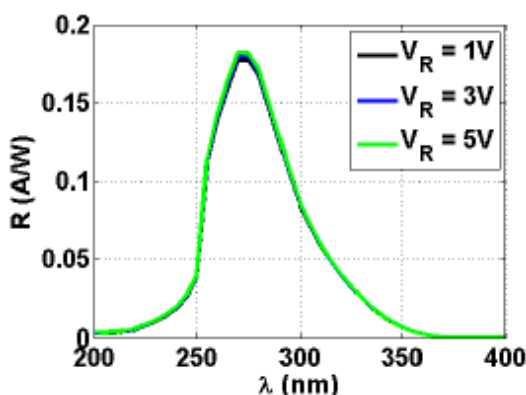




Silicon Carbide UV Avalanche Photodiode (APD) EOC-SiC-UV-APD-1.45-QFN-PCB

Electro Optical Components introduces UV Solar Blind Silicon Carbide (SiC) Avalanche Photodiode (APD) for low signal applications in the UV range.



The Silicon Carbide (SiC) UV APD has many of the properties of other APDs in that it is extremely sensitive and has high signal gain, but is only sensitive to UV (see wavelength response curve above). Because the substrate is tougher SiC, the bias voltage is higher than silicon based devices, around 180 VDC. These SiC UV APDs are a solid state replacement for UV PMTs (Photo Multiplier Tubes). Besides responding only to the UV, the tough silicon carbide (SiC) gives you:

- Stability in high energy UV applications
- Higher temperature stability than silicon

The general specifications are:

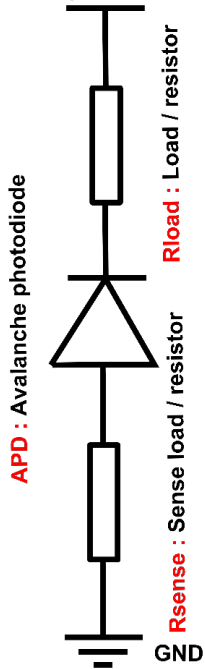
Sensitivity	1 nW/cm ²
Gain	10 ⁵ - 10 ⁶
Bias Voltage	~180 VDC
APD Chip Size	1.2mm ²
Active Area	0.0044 mm ²
Package	QFN-16 (4mm x 4mm); Pin 11 + Positive, Pin 2 - Negative

The SiC UV APD is ideal for a variety of low UV light applications including:

- Flame detection
- UV photon counting
- Low level UV monitoring

Passively quenched Geiger Circuit / Counter : Brief explanation of operation

Vsupply : BV + OV



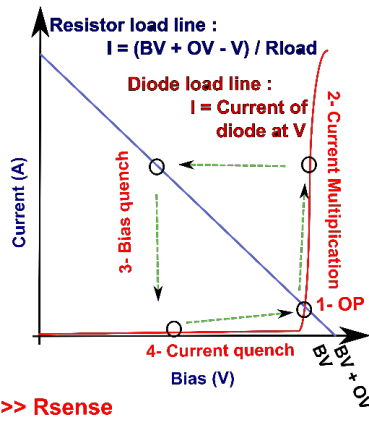
1- OP : DC operating point before the start of a pulse. Diode voltage is equal to OP, which is below BV. Load voltage is equal to $BV + OV - OP$

2- Current Multiplication : Increase in current due to an absorbed photon or a thermal carrier resulting in a light induced pulse or a dark pulse, respectively.

3- Bias quench : Increase in current results in an increase in voltage over the load, and hence a decrease in voltage over the diode.

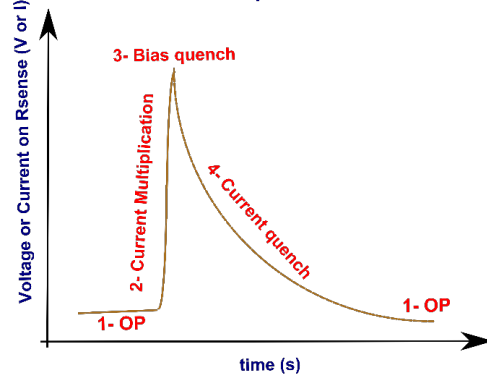
4- Current quench : Decrease in voltage over the diode quenches avalanche multiplication and current gain. This will reset the circuit back to its OP.

Load Line Analysis



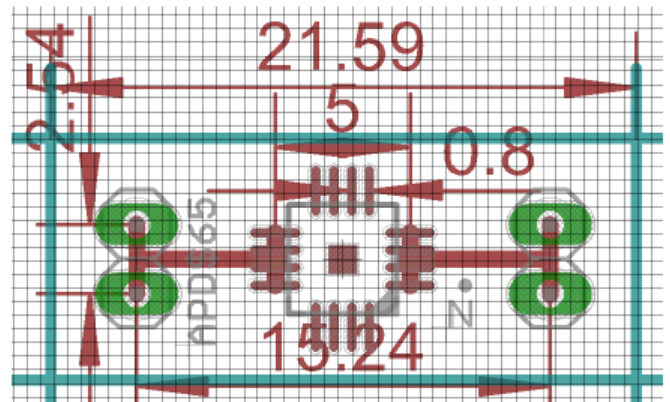
$R_{load} \gg R_{sense}$

Time domain representation



BV : Breakdown Voltage : Defined as the voltage where $d^2I_{diode}/dV^2 = 0$
 OV : Over-Voltage or Over-Bias : Defined as voltage in excess of BV

QFN-PCB Package Picture and Drawing



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One possible circuit is on the data sheet (below). It consists of two resistors. One Mega-Ohm (RL) on the N-side (cathode) and one 50-Ohm (RS) on the P-side (anode). The output can be taken between the 50-ohm resistor and the anode, as illustrated.. This is the quenching circuit that facilitates Geiger mode operation.

If you need more circuit design than that, you should contact us about employing a bias control circuit.

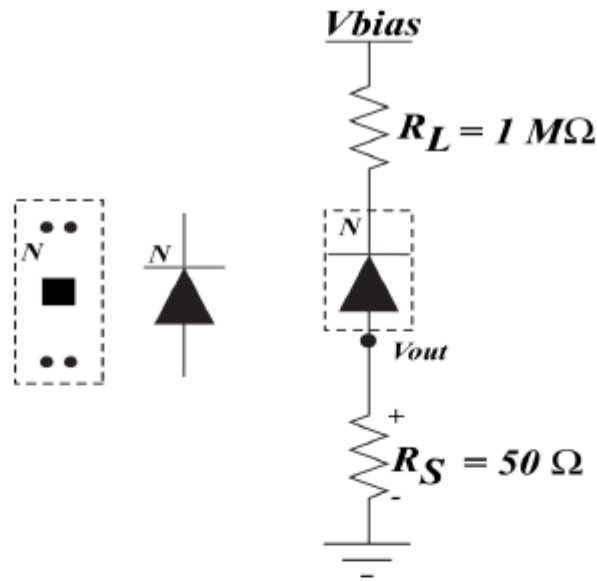


Fig. 1 Pinout and sample Geiger mode readout circuit configuration.

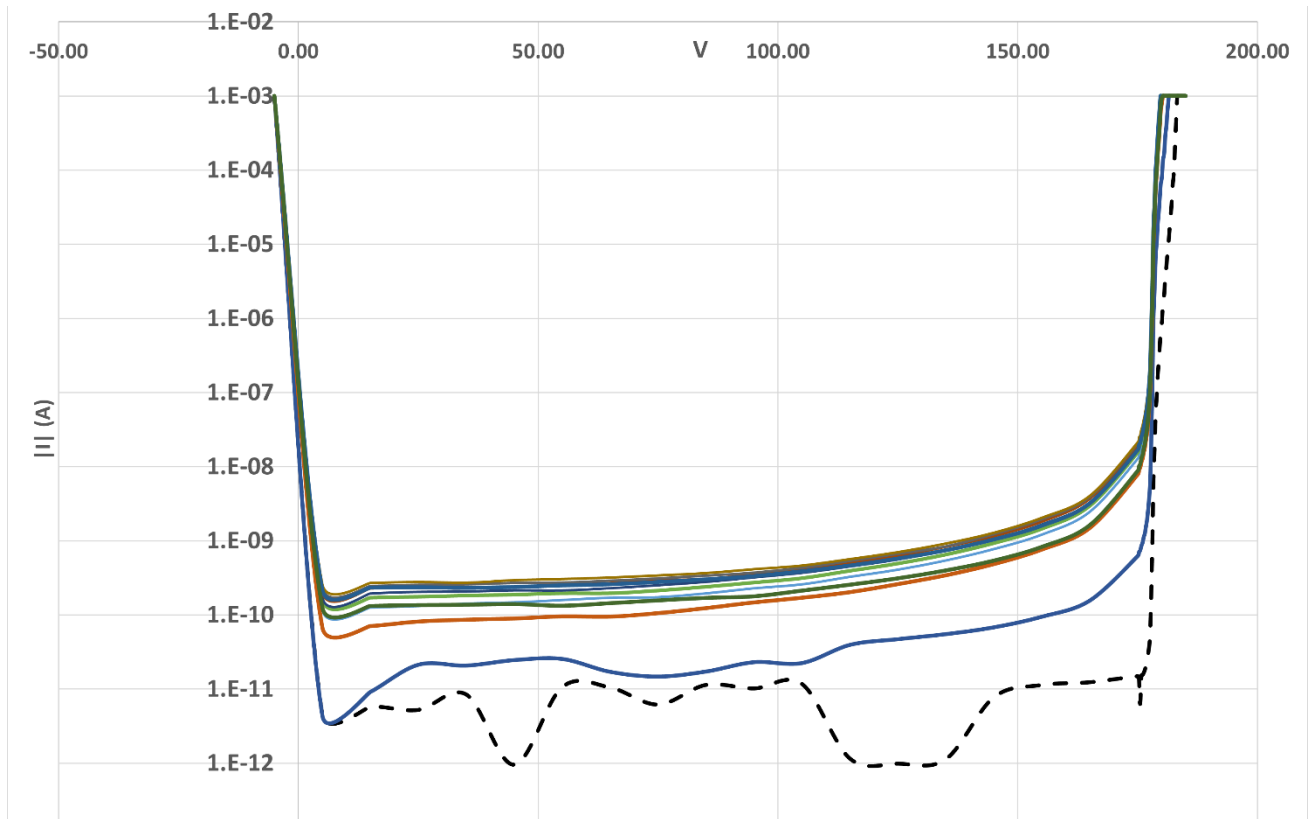


Fig. 2 Reverse I-V characteristics. Black Dashed Line: Dark current. Solid Lines: Photo response between 200-340 nm.

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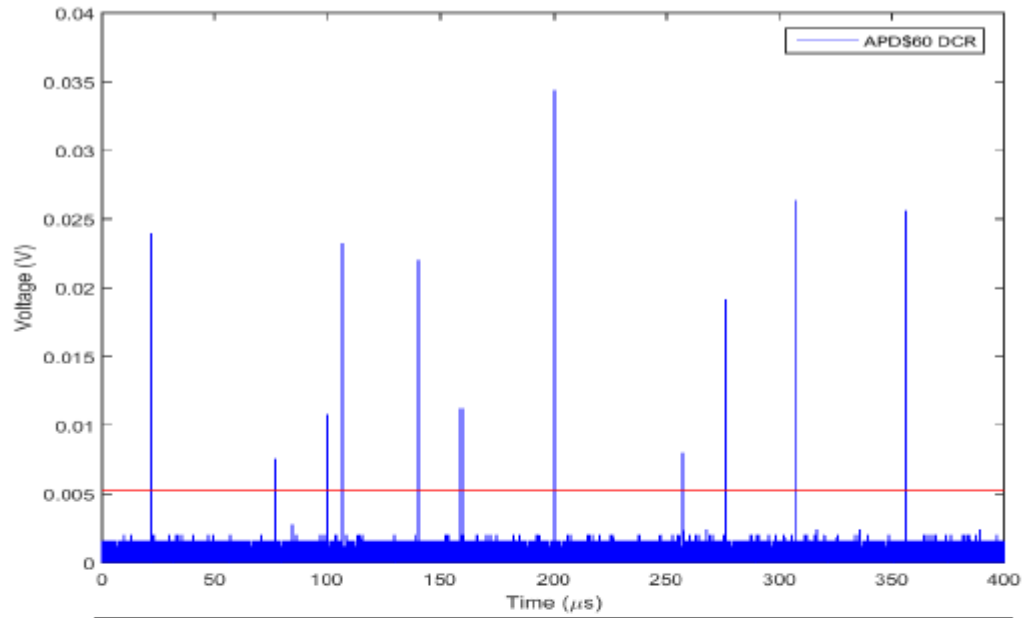


Fig. 3 Sample Geiger mode response in the dark. The horizontal line is the counting threshold.

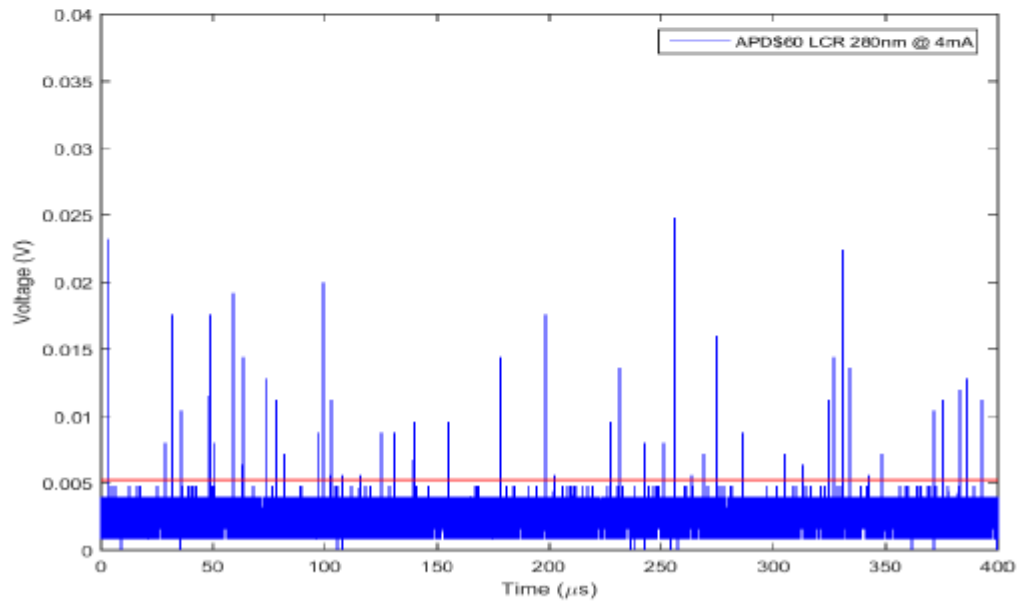


Fig. 4 Sample Geiger mode response under 280 nm illumination.

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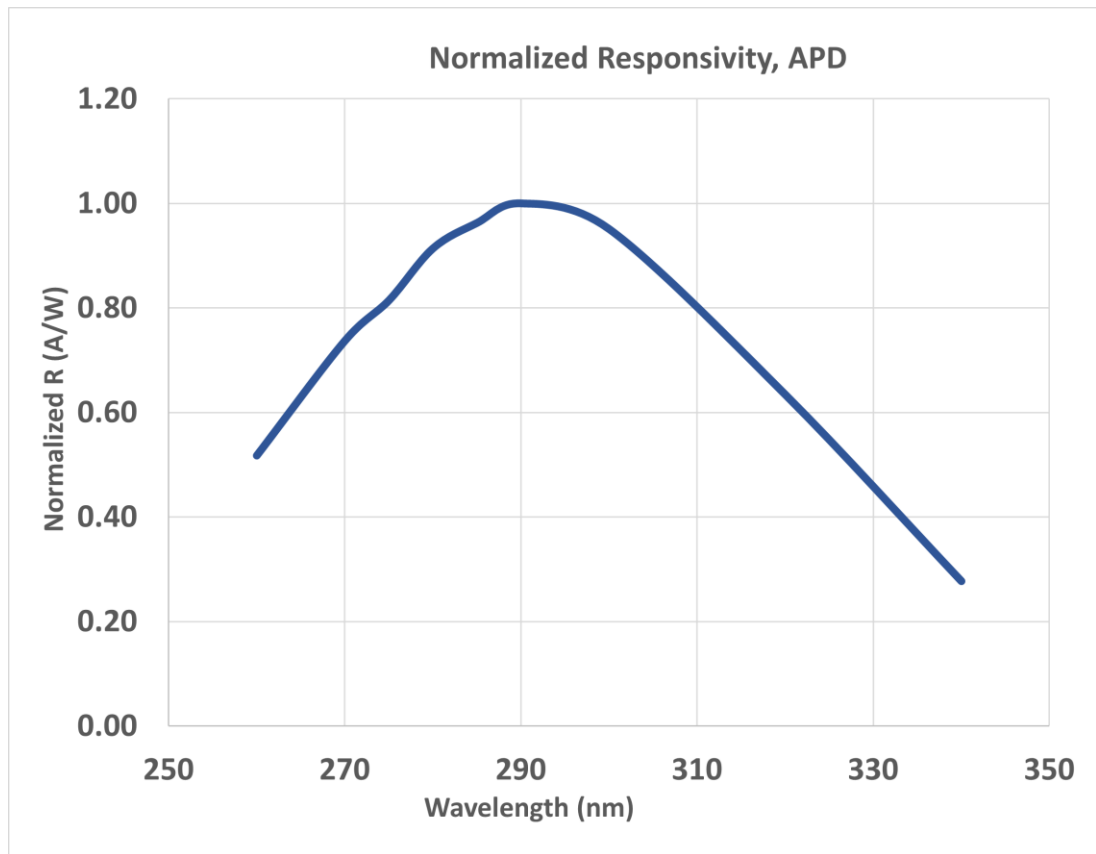


Fig. 5 Normalized Linear Responsivity at $V_R = 1$ V

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