Speed

Detector Speed

the detector risetime / falltime is calculated by that formula:

$t_{r/f} = 2\pi RC$ with R = internal resistance of the amplifier and C = capacitance of the photodiode

Example = a typical value of R is 50Ω and the C value for a SG01S photodiode is 21pF. This calculates:

$t_{r/f} = 2\pi * 50\Omega * 21 * 10^{-12}$ F = $6{,}59 * 10^{-9}$ s = 6,59 ns

Amplifier Speed

the amplifier response time is determined by its feedback resistor R capacitor C following this formula:

$\tau = R * C$

Example = a typical value of R is 10MΩ and for C is 0,1 nF. This calculates:

$\tau = 10 * 10^{6}\Omega * 0{,}1 * 10^{-9}$F = 10^{-3} s = 1 millisecond

The time until a clear signal is present is approx. 3-5 $* \tau$

Conclusion

The response behaviour of a photodiode-amplifier system is always determined by the properties of the amplifier as its response time is higher by approx six orders of magnitude

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Saturation

The saturation current I_{sat} of a photodiode is determined by its open circuit voltage V_{OC} and its serial resitance R_S following the formula:

$I_{sat} = V_{OC} / R_S$

A typical value (SiC photodiode) for V_{OC} is 2,0V and for $R_S = 5\Omega$. This calculates:

$I_{sat} = 2.0\ V / 5\ \Omega = 0{,}4\ A = 400mA.$

The saturation radiant intensity ζ calculates by the below formula:

$\zeta = I_{sat} / (S * A)$

Where S is the radiant sensitivity of a photodiode and A is the active area. A typical value for S is 0,13 A/W and A = 0,055 mm^2 (valid for SG01S). This calculates:

$\zeta_{sat} = 0{,}4\ A / (0{,}130\ A/W * 5{,}5 * 10^{-8}\ m^2) = 55{,}94\ MW/m^2 = 5{,}59\ KW/cm^2$

Conclusion:
A SG01S UV photodiode will saturate at a radiation of approx. 5,6 kW/cm^2. As such a high UV radiation is almost impossible to generate one can conclude that saturation is not an issue to be considered.

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