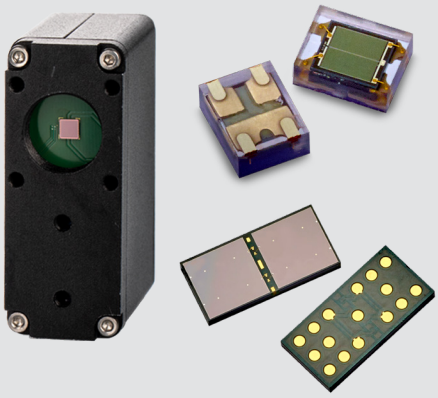
BROADCOM®

Product Brief

AFBR-S4 SiPM Family

Silicon Photomultipliers



Key Features: NIR

- 28% PDE at 905 nm
- High dynamic range with > 6000 SPADs per mm^2
- 15-ns cell recharge time
- Various form factors:
  - Dual-channel 1x1 mm^2 in a molded leadframe package
  - Line array in an automotive package
- Samples available

Key Features: NUV

- 63% PDE at 420 nm
- Crosstalk probability < 23%
- Afterpulsing probability < 1%
- DCR 120 kcps/mm^2
- Overmolded PCB package
- Samples available

Overview

Silicon photomultipliers (SiPMs) are arrays of single-photon avalanche diodes (SPADs) that are operated in Geiger mode and connected in parallel with common anode and cathode contacts. Operating in Geiger mode enables the detection of single photons with a high gain of about 1×10^6. The corresponding SiPM signals have rise times in the subnanosecond range, making them perfectly suitable for timing critical applications, for example LiDAR and TOF-PET.

Broadcom® SiPM Technologies

Broadcom offers a wide range of different SPAD and SiPM technologies, all of which are tailored toward application with the goal of achieving best-in-class performance. Two different SiPM families are available and cover near infrared (NIR) and near ultraviolet (NUV) wavelength ranges.

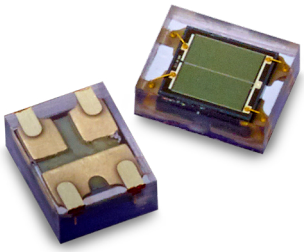
Visible to NIR-Sensitive SiPMs

Broadcom released the first SiPM product based on the advanced NIR process technology in 2023. The newly developed NIR process is optimized for automotive and industrial LiDAR, ranging, and life-sciences applications. It offers the system designer peerless performance in respect to key parameters such as PDE, crosstalk, afterpulsing, and recovery time.

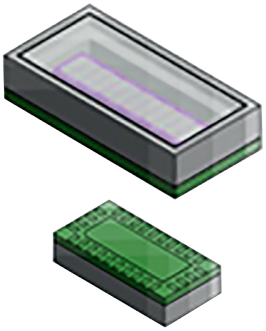
NUV-Optimized SiPMs

Broadcom recently released the first products based on its newly developed NUV-MT SiPM technology. This technology brings performance to unprecedented levels (for example, PDE, crosstalk, and dark count rate) and allows customers to achieve best-in-class performance in their applications, for example, TOF-PET, flow cytometry, radiation and X-ray detection, X-ray photon counting, and line-of-sight data communication. In parallel, a new package type, an overmolded PCB package, has been developed that will serve the demands of harsh environments and industrial and mining applications.

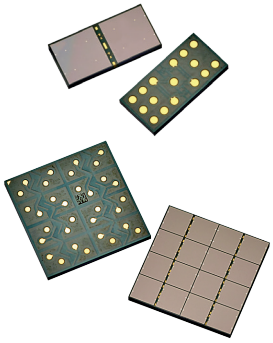
AFBR-S4 SiPM Package Variants



Overmolded Leadframe Package



OQFN Package



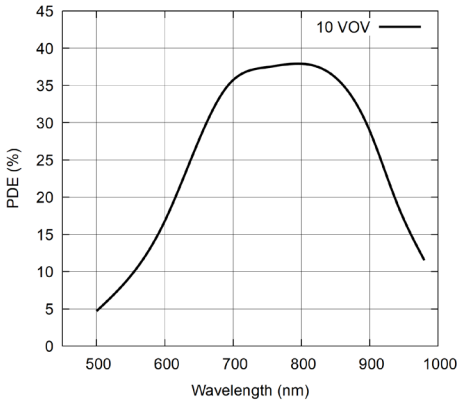
Overmolded PCB Package

AFBR-S4 SiPM Variants, Key Performance, and Package Types

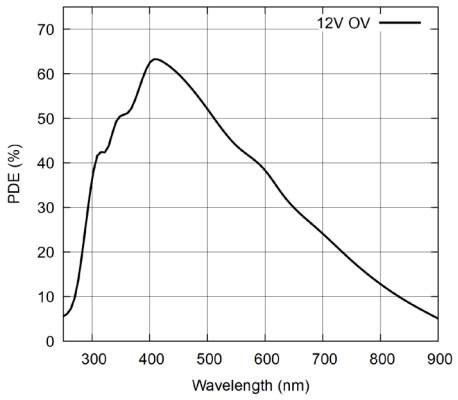
Type	Wavelength Range (nm)	PDE	Package Size (mm^2)	Sensitive Area per Channel (mm^2)	SPAD Pitch (µm)	Number of Channels	Part Number
NUV-MT	250 to 900	63% at 420 nm	2.7 x 2.5	2 x 2	40	1	AFBR-S4N22P014M
NUV-MT	250 to 900	63% at 420 nm	8.26 x 8.26	3.7 x 3.6	40	4	AFBR-S4N44P044M
NUV-MT	250 to 900	63% at 420 nm	6.5 x 7.1	6 x 6	40	1	AFBR-S4N66P014M
NUV-MT	250 to 900	63% at 420 nm	4.3 x 4.2	3.7 x 3.6	40	1	AFBR-S4N44P014M
NUV-MT	250 to 900	63% at 420 nm	13.5 x 6.5	6 x 6	40	2	AFBR-S4N66P024M
NUV-MT	250 to 900	63% at 420 nm	16 x 16	3.7 x 3.6	40	16	AFBR-S4N44P164M
NUV-MT (Eval-kit)	250 to 900	63% at 420 nm	4.3 x 4.2	3.7 x 3.6	40	1	AFBR-S4E001
NUV TIA module	250 to 900	30% at 420 nm	3.3 x 3.3	3 x 3	15	1	AFBR-S4KTIA3315L
NIR30	500 to 980	28% at 905 nm	1.9 x 1.5	0.5 x 1	12.5	2	AFBR-S4P11P012R
NIRFast	500 to 980	21% at 905 nm*	1.9 x 1.5	0.5 x 1	12.5	2	AFBR-S4P0102L3R
NIRFast	500 to 980	21% at 905 nm*	8.0 x 4.0	0.24 x 1.1	12.5	24	AFBR-S4P0124P3TA

* PDE reached within 5 ns.

AFBR-S4 Spectral Sensitivity (PDE)



PDE Spectrum NIR30



PDE Spectrum NUV-MT

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