

The greatest and most marvelous things are often the most simple!

CEO's Note

Dear Readers,

A photo diode is a simple part. Everyone knows that. However, it can be made even simpler. Simple by assembling the photo diode in a standard SMD process. And simple in a way that the required PCB space is exactly the same as the active area of the photo diode. Not just like the other photo diode chips available on the market, which need a bonding wire from the photo diode top side to the PCB. And what about photo diode arrays? Even more bond wires are needed to connect the individual photo diodes.

This process is not really compatible with standard SMD process and need special equipment, special, know how and special people. Yield losses are the standard. To solve these common problems, we developed the OHD50L technology. It allows a very low cost, low effort and high efficient way to design and use photo diodes and photo diode arrays. It was never easier to assemble photo diode chips on PCBs. And it was never more cost effective than using photo diodes from epc. Try it!

Beat De Coi

Photo diodes for wearable devices

Wearable devices are extremely demanding in terms of required space, power consumption and cost. epc has developed a technology which supports these three requirement cornerstones in the most optimized way. Let's compare the known standard to epc's disruptive technology.

A conventional photo diode is based on a silicon chip which is either attached to a PCB or a lead frame to form one contact of the diode. The other contact is made by a bond wire from the top side of the silicon chip, on a non photo-sensitive bond pad, to the PCB or a second part of a lead frame. Since the bond wire is a very sensitive part of the whole assembly, a glob top is needed to protect it. It's obvious that this concept has several disadvantages:

Non-SMD compatible processes are needed (die attach, wire bond, glob top)

The bond pad on the chip is not photo-sensitive and therefore reduces the overall sensitivity

The glob top is in the optical path where it has unwanted optical disturbance like refraction, reflection, absorption, etc.

The bond wire consumes space on the PCB which cannot be used for other parts

These disadvantages are all eliminated by using photo diodes based on epc's OHD50L technology. The photo diodes can be assembled with standard SMD assembly lines. Since the chip scale packaging is using solder balls, the diodes do a self-alignment with a final position accuracy in the range of $\pm 20\mu\text{m}$ (x/y). Because there is no bond wire needed, the whole chip surface except a small guard ring along the perimeter of the photo diode is photo sensitive. The light entrance window is directly the anti-reflection coating. Thus, the loss of useful light is minimized to typically less than 1%. No other technology allows better usage of the available light!

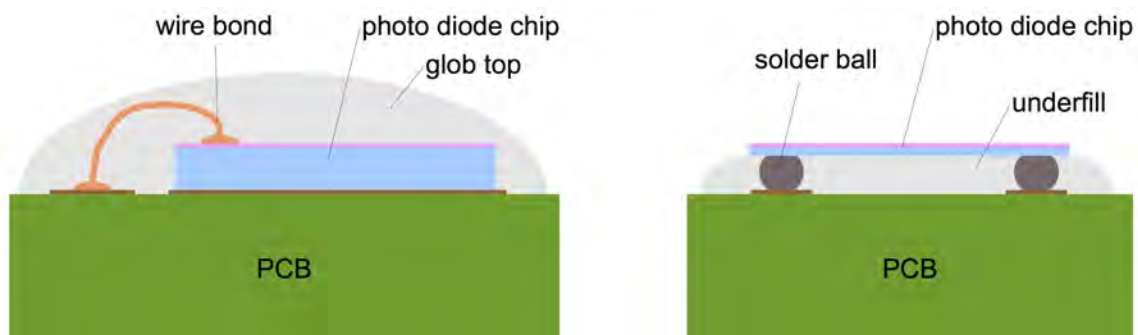


Photo diode comparison: Conventional packaging (left) and epc's space and cost saving technology (right). Both photo diode share the same photo-sensitive area (drawn in scale)

Standard photo diodes and arrays based on the OHD50L technology are available from epc:

epc200: Single photo diode 1.75 x 1.75mm

epc300: 2 photo diode array 0.5 x 1.0mm each

epc310: 4 photo diode array 0.5 x 1.0mm each

epc320: 8 photo diode array 0.5 x 1.0mm each

epc330: 16 photo diode array 0.5 x 1.0mm each

Customer-specific photo diodes and arrays are available within short time.

Customer specific photo diode arrays

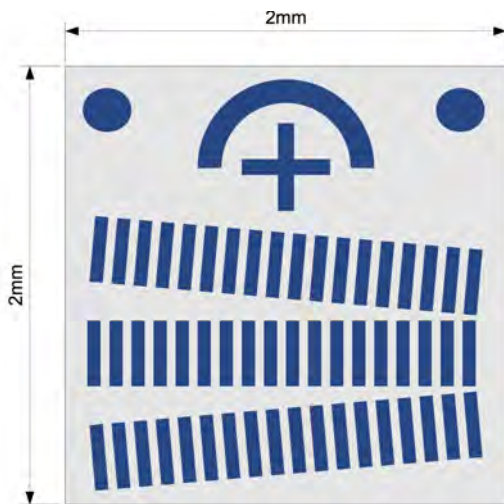
Photo diode arrays are the choice of desire when it comes to applications like wearable devices, encoders, triangulation sensors or positioning sensors. All of them have in common that they need high speed, high sensitivity, low crosstalk between neighbor diodes and high positioning accuracy in the SMD assembly process. In addition to that, the typically very low photo current is often the source for electro-magnetic interference problems which ask for additional shielding. epc's OHD50L technology provides solutions for all requirements:

Very low capacitance of approx. 4pF/mm²

Very low dark current of 0.8nA/mm²

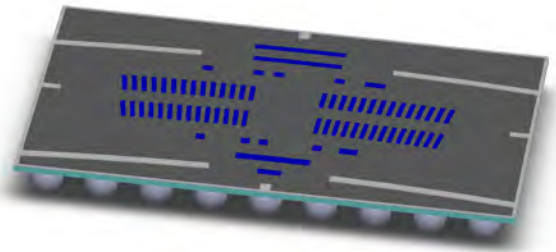
Very high photo current of approx. 6.5μA/mm²
@ 1mW/cm², 850nm

Integrated metal shielding



*Need a photo diode array like this?
No problem, epc's OHD50L technology makes it possible!*

Very important in all the above mentioned applications is a very low crosstalk between neighbor diodes. epc's unique photo diode array process OHD50L was spun-off from a high performance imager CCD process. In imaging, low crosstalk is crucial to achieve an excellent image quality. Thanks to the CCD imaging technology development, the photo diode arrays also gain from this very high R&D effort. In particular, a very low crosstalk of less than 1% of two 40μm pitch photo diodes which are arranged side by side without a gap in between.



Possible photo diode array layout for an encoder

The picture above shows a (hypothetic) photo diode array for an encoder. The ten photo diodes are arranged to form a part of a circle to the axis of the encoder wheel. Clearly visible are the solder balls underneath for the solder joints with the PCB. The dark grey area is a metal layer which can be connected to the a ground plane in order to optimize the EMC properties.

Please ask our sales team for your own customer specific photo diode array. We're glad to serve you with a high performance but very cost effective solution.

Our distribution partners

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