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Impact of Surface Condition on the Sensitivity of the Molded Leadframe Package (MLP/SMT) SiPM Sensors



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OVERVIEW

Ideally, there should be no scratches or damage to the surface of a clear SMT (MLP) packaged SiPM. ON Semiconductor use a 100% optical screen to reject parts that have significant surface scratching, thus ensuring that all parts that reach our customers are within specification.

However, scratches can be introduced during the handling and assembly process. All customers, their assemblers and contract manufacturers using SMT/MLP packaged SiPM sensors should refer to the [SMT \(MLP\) Handling and Soldering](#) Application Note for guidance on avoiding surface damage to the sensors.

If surface scratching has occurred, this application note will show that it has negligible impact on the measured responsivity of the sensor.

METHOD

To study the impact of SMT surface condition, the responsivity of a 6 mm sensor was tested in the following conditions:

- *Initial Device* – (Figure 1)
A pristine part which meets ON Semiconductor specification and contains no visible scratching on the surface. This represents a typical, clear SMT-packaged SiPM from tape and reel.
- *Lightly Scratched* – (Figure 2)
The part has been lightly scratched to provide obvious visible scratch marks on the surface of the clear SMT package. The part is outside of the ON Semiconductor specification.
- *Heavily Scratched* – (Figure 3)
The part has been heavily scratched across the entire surface area of the clear SMT package. Obvious scratches are apparent on the surface of the SiPM. The part is outside of the ON Semiconductor specification.

The responsivity of the sensor was recorded at each of the 3 conditions listed above, before moving on the next.

RESULTS

Figure 4 shows the responsivity recorded for each of the 3 conditions described above. It can be clearly seen that the scratches have a negligible effect on the responsivity of the device. The peak values from the lightly and heavily scratched plots in Figure 4 are taken and compared to the initial measurement peak value. The percentage difference between the initial and lightly scratched values is 0.21%. The percentage difference between the initial and heavily scratched values is 0.44%. This is within the measurement error of the responsivity test station.

APPLICATION NOTE

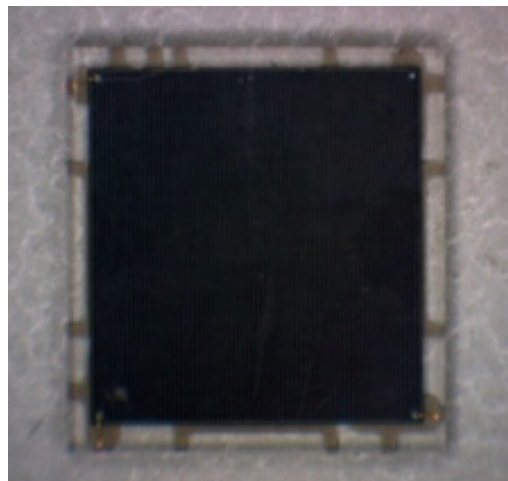
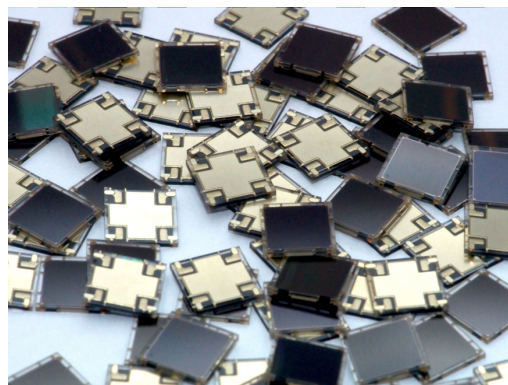


Figure 1. Initial Device (Part in Spec.)

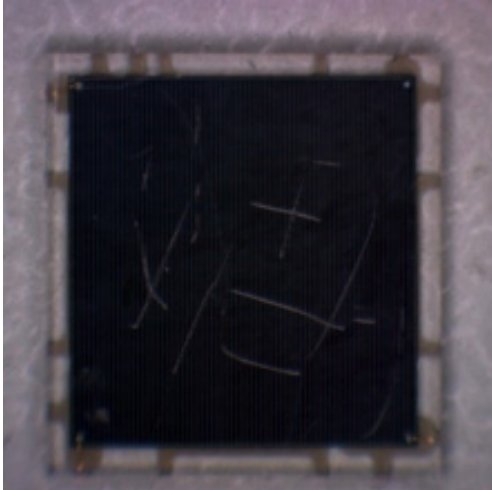


Figure 2. Package Lightly Scratched (Part Outside Spec.)



Figure 3. Package Heavily Scratched (Part Outside Spec.)

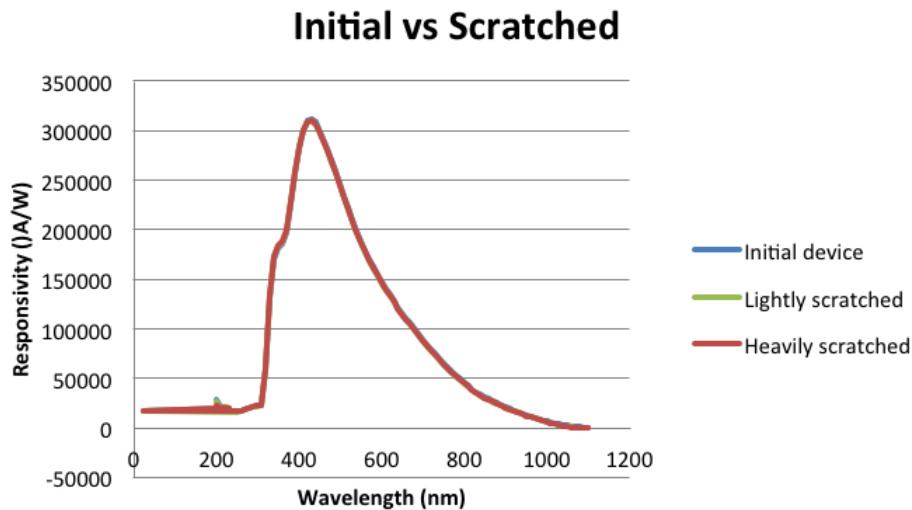



Figure 4. Responsivity Plots of Initial (in Spec) Device and with Subsequent Surface Scratching

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