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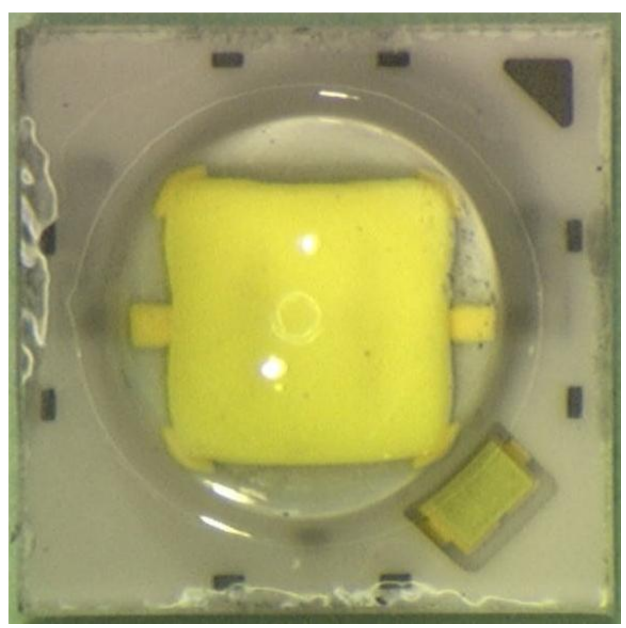
# Reverse Costing analysis



## Nichia
## NCSW119T

September 2010 - Version 3

Written by: Sylvain HALLEREAU

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**Version 2 : 2 slides have been add on the active layers.**
**Version 3 : the package cost has been modified with a phosphor cost at $0.0015.**

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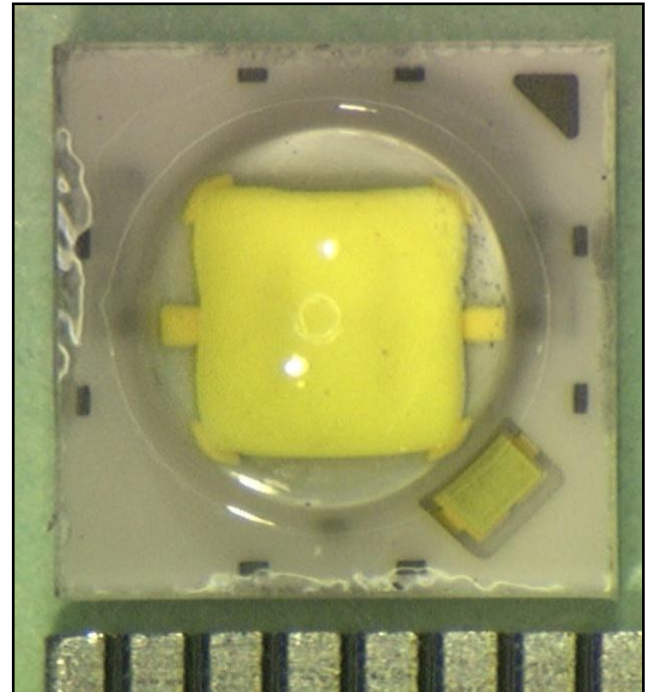
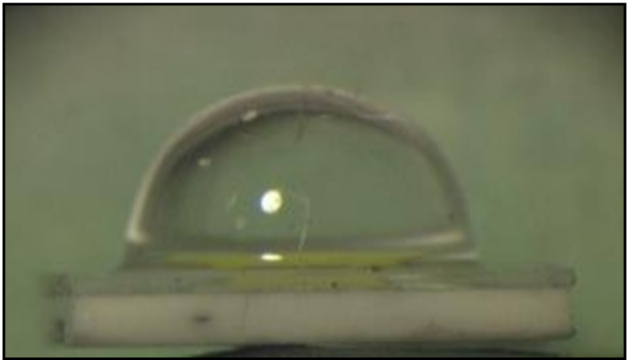
# Package Views



Top view of the NCSW119T. The NCSW119T package is 3.5x3.5mm in dimension.

Underside view of the NCSW119T.



Elevation views of the NCSW119T LED. The ceramic substrate is 450um thick.

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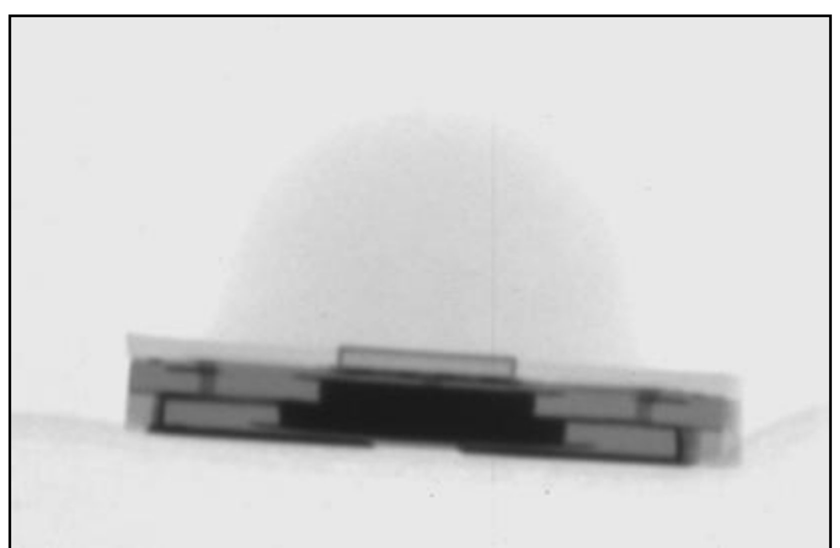
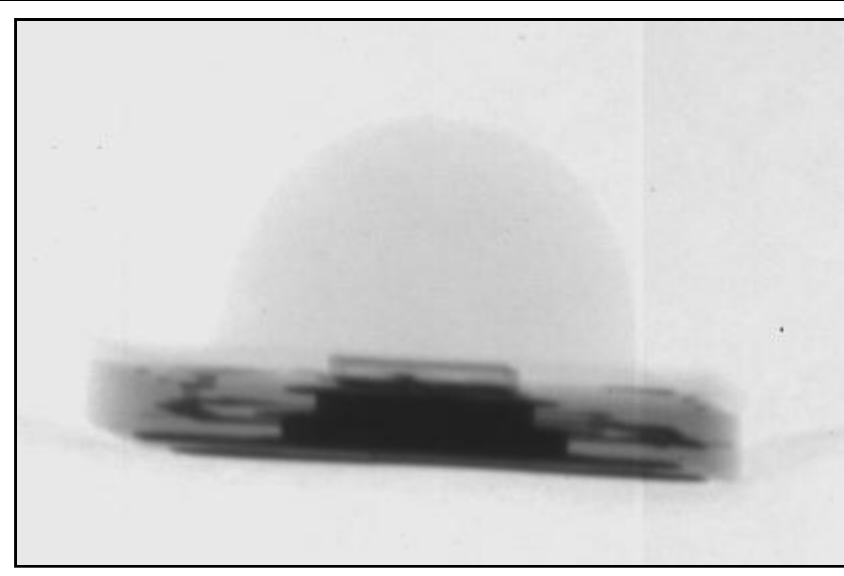
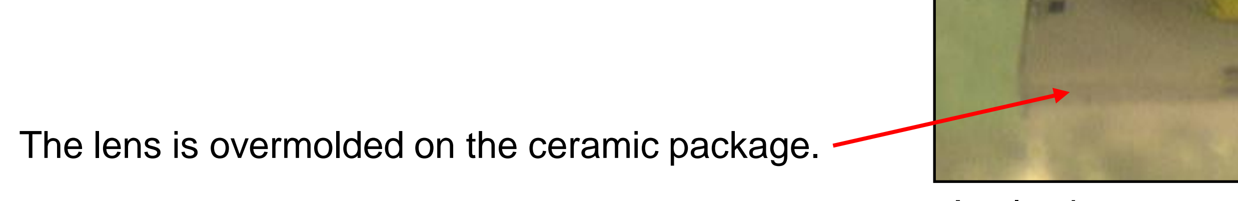
# Package X-Ray





Elevation view XRAYs, in the X and Y directions and at different contrasts.

The fluorescent medium.
Only the LED is coated.



The lens is overmolded on the ceramic package.

Angle view

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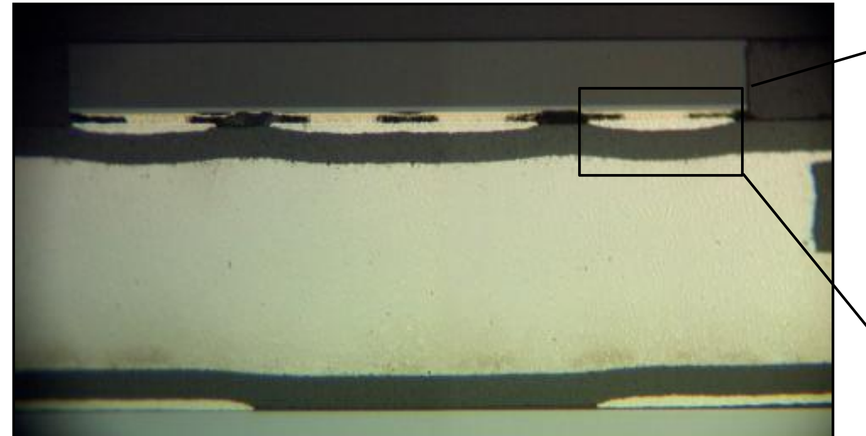
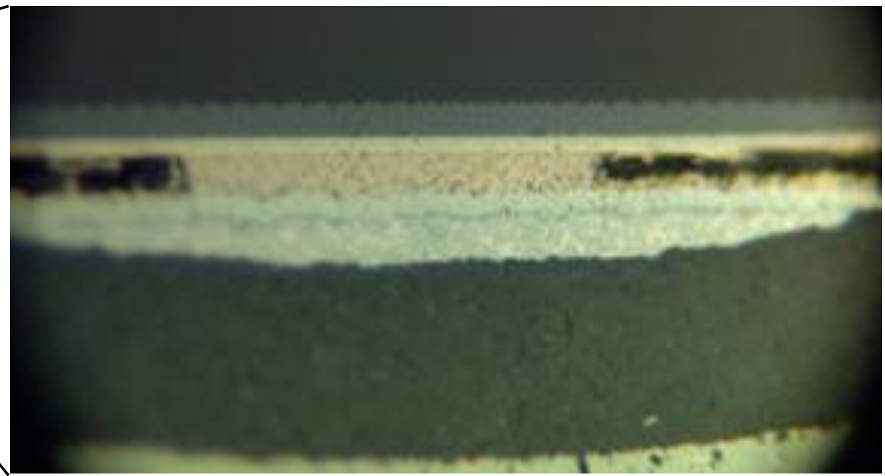
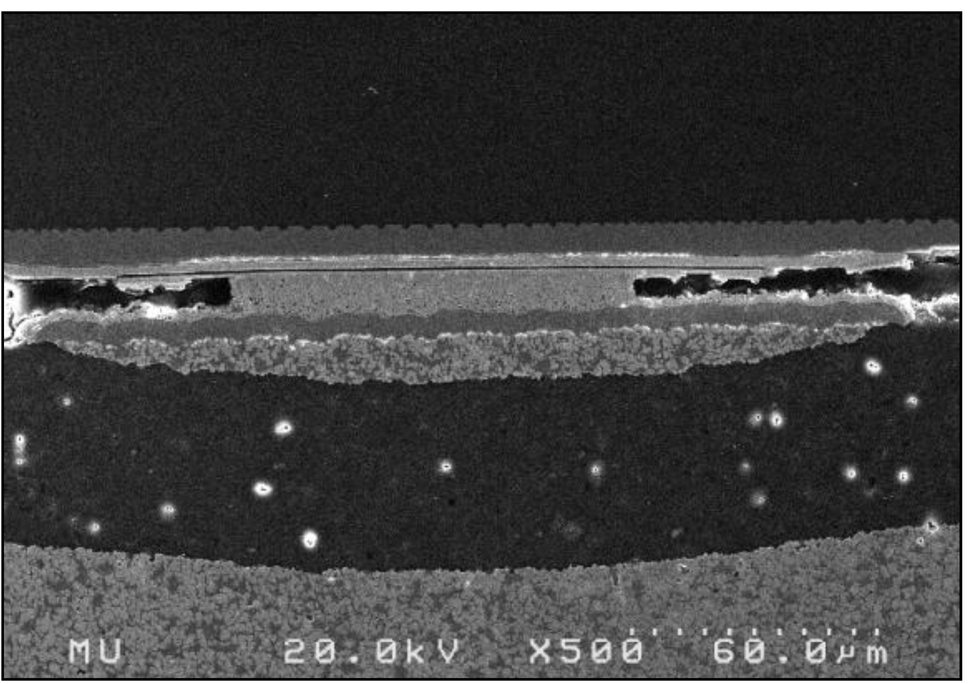
# Bumps



View of the bumps with through-the-lens illumination.



Optical and SEM close-ups of bumps.

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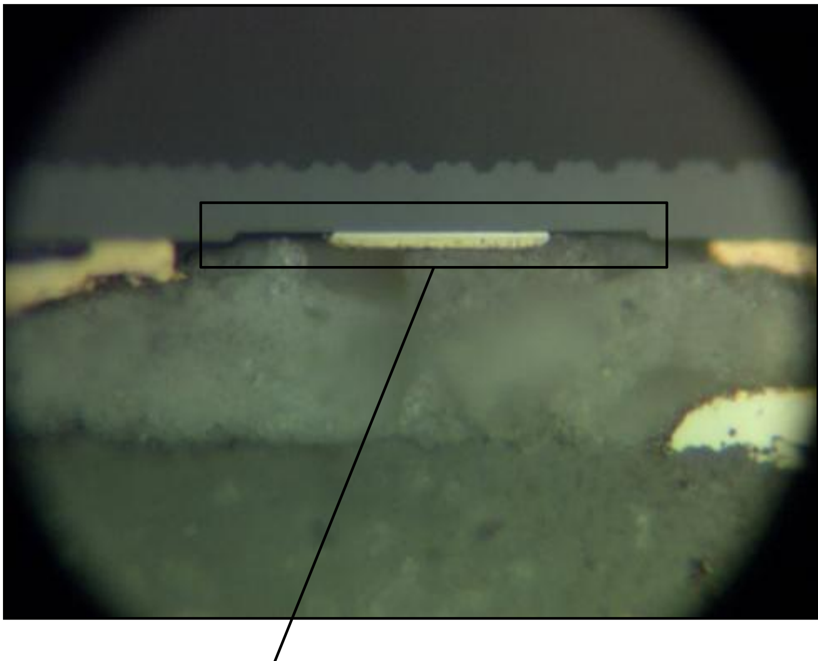
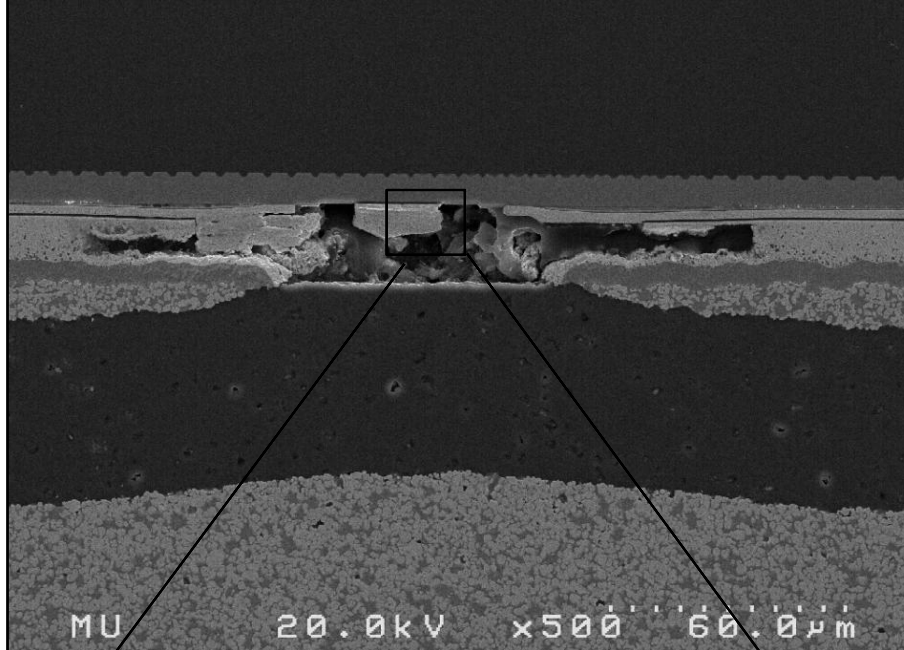
# Cathode Electrodes

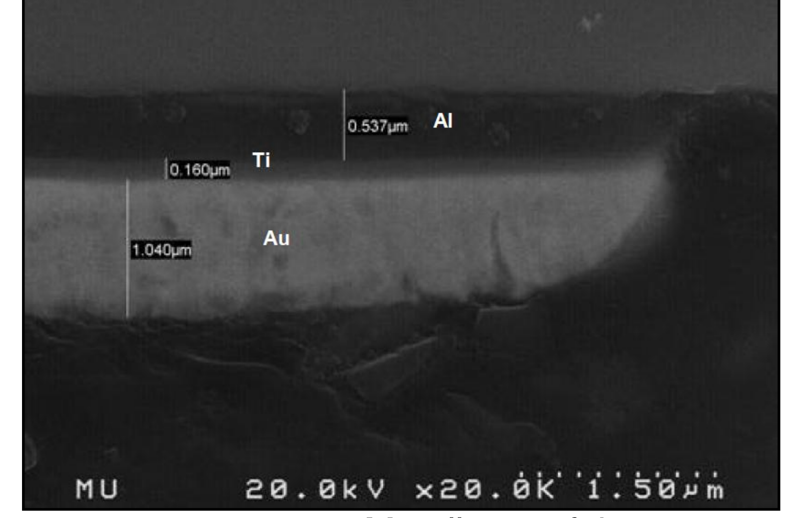
Optical image of boxed region. This is the cathode die contact.



The GaN layer is etched for allow the contact with the N layer.




SEM image of boxed region.




Metallurgy of the contact

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# Anode Electrodes

6.031µm
6.336µm
6.183µm
6.870µm
8.168µm
2.748µm
2.061µm
MU 20.0kV x1.50K 20.0µm

The Ag and Au-Ti-Ti layers are deposited by shadow masking.

A thick gold layer is deposited and patterned.

A thin recess is realized in the gold layer.

The W, Al, TiW and 0.Xµm of gold are deposited by shadow masking.

SEM cross section view : anode electrode with the bump between the LED and the ceramic package.

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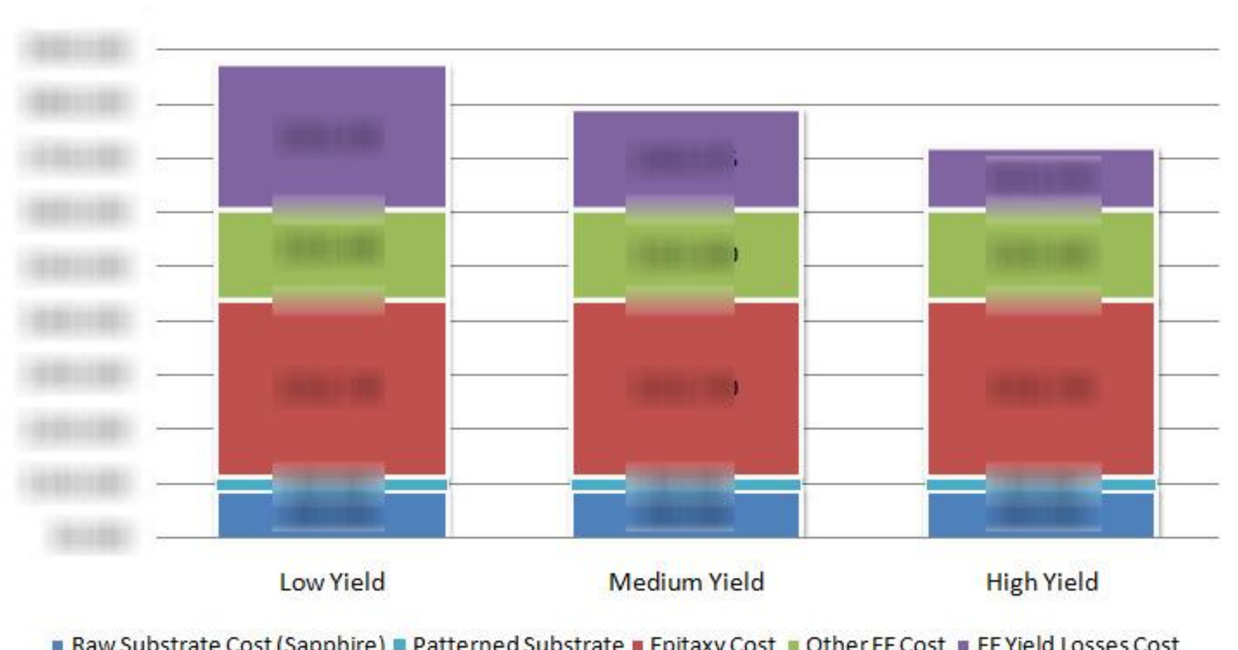
# LED Front-End Cost

| Total Front-End | Low Yield | | Medium Yield | | High Yield | |
|---|---|---|---|---|---|---|
| | Cost | Breakdown | Cost | Breakdown | Cost | Breakdown |
| Raw Substrate Cost (Sapphire) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Patterned Substrate | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Epitaxy Cost | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Other FE Cost | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| FE Yield Losses Cost | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| **TOTAL Front-End Cost** | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

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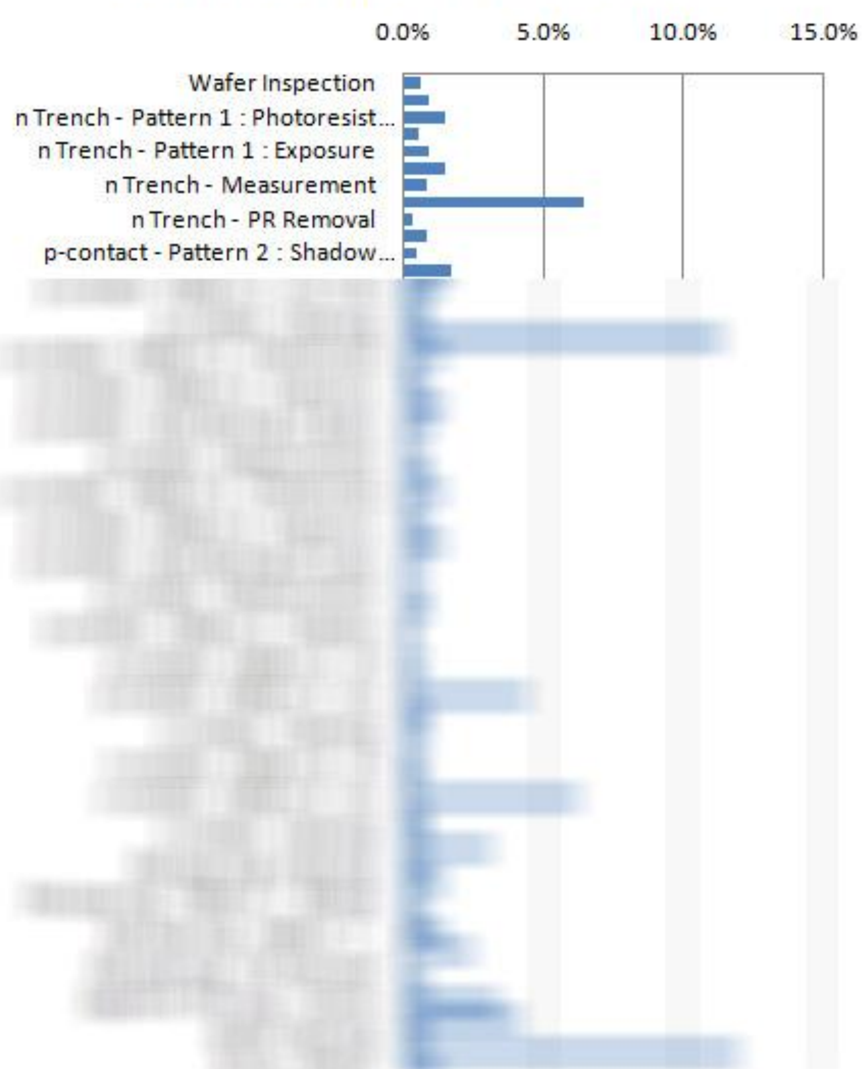
| Other FE Steps | Cost | Breakdown |
|---|---|---|
| Wafer Inspection | [illegible] | [illegible] |
| Wafer Cleaning | [illegible] | [illegible] |
| n Trench - Pattern 1 : Photoresist Coating | [illegible] | [illegible] |
| n Trench - Pattern 1 : Baking | [illegible] | [illegible] |
| n Trench - Pattern 1 : Exposure | [illegible] | [illegible] |
| n Trench - Pattern 1 : Development | [illegible] | [illegible] |
| n Trench - Measurement | [illegible] | [illegible] |
| n Trench - Dry Etching (1.4µm) | [illegible] | [illegible] |
| n Trench - PR Removal | [illegible] | [illegible] |

•**Details of the equipment cost per step are given in the Excel Spreadsheet.**

***Other FE Step Cost Breakdown***

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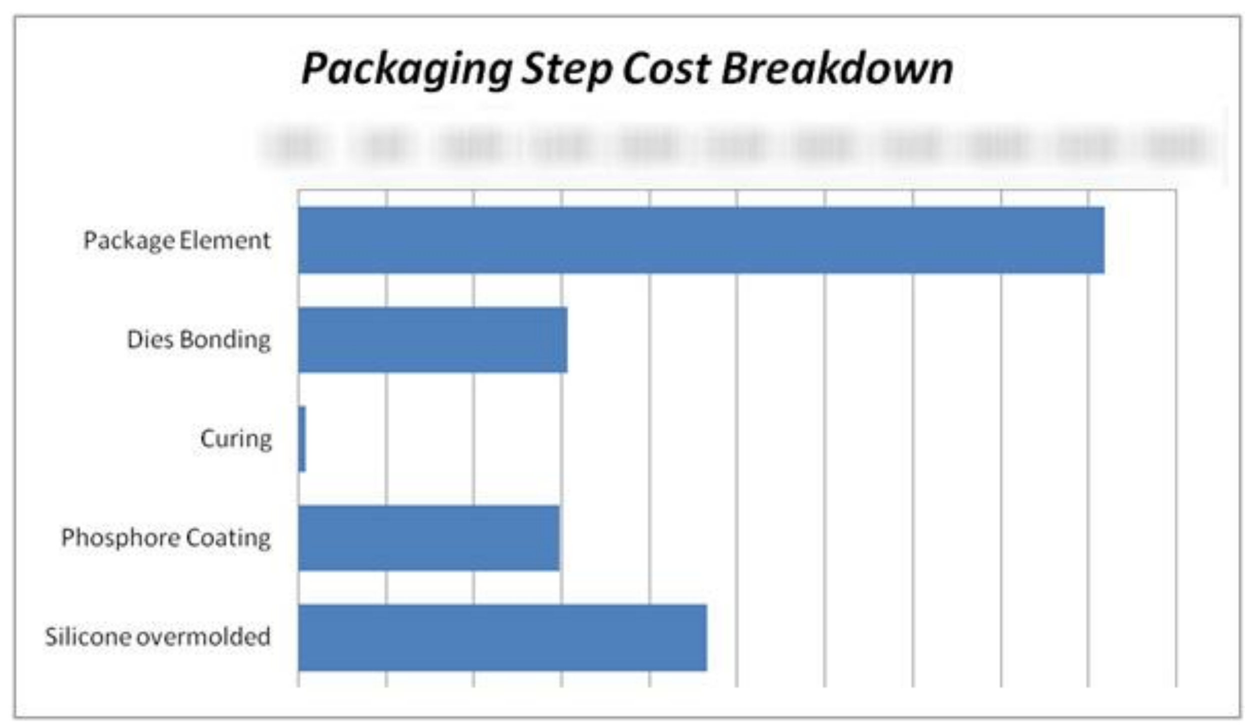
# Back-End 1 : Packaging Cost Details

| Packaging Process Step | Cost | Breakdown |
|---|---|---|
| Package Element | [illegible] | [illegible] |
| Dies Bonding | [illegible] | [illegible] |
| Curing | [illegible] | [illegible] |
| Phosphore Coating | [illegible] | [illegible] |
| Silicone overmolded | [illegible] | [illegible] |
| TOTAL | [illegible] | [illegible] |

- The total packaging cost is estimated to $0.XXX

- The cost by step includes the equipment cost, the material cost and the labour cost.

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# Ideal Manufacturer Price

| Versions | Final component cost | Ideal Floor price | Ideal Manufacturer price |
|---|---|---|---|
| Low Yield | [illegible] | [illegible] | [illegible] |
| Middle Yield | [illegible] | [illegible] | [illegible] |
| High Yield | [illegible] | [illegible] | [illegible] |

**The ideal manufacturer price is obtained for a binning yield of 100%.**

**Component Cost & Price**

Low Yield | Middle Yield | High Yield

Final component cost | Ideal Floor price | Ideal Manufacturer price

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# Conclusion

- **Reverse costing analysis represents the best cost/price evaluation given the publically available data, completed with industry expert estimates.**

- **These results are open for discussion. We can re-evaluate this circuit with your information. Please contact us:**

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