



Product Brief

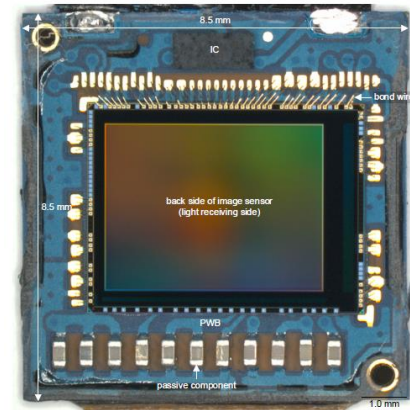
Samsung S5K3P3SX and OmniVision OV23850 Imager Process Reports



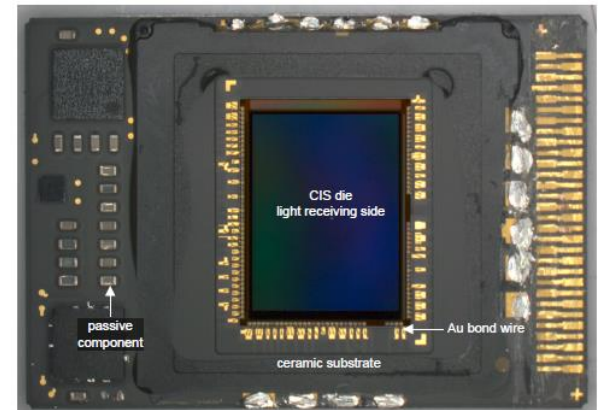
Q1 2016

Imager Process Review

- Chipworks has previously reported on multiple generations of Sony stacked (Exmor RS) image sensors, starting with the ISX014 in Q1 2013
- First-generation stacked image sensor chips from Samsung and OmniVision were procured in H2 2015 and detailed pixel structural and layout review reports were launched on examples of each of these new technology platforms
- These reports add to Chipworks' extensive library of reports detailing the state of the art of the CMOS image sensor technology sector
- Both IPR reports include substrate dopant analysis by Chipworks' new scanning microwave impedance microscopy (sMIM) tool, extensive transmission electron microscopy (TEM), scanning electron microscopy (SEM), and secondary ion mass spectrometry (SIMS) analysis of the stack chip structures



**Samsung S5K3P3SX
16 MP ISOCELL CIS**

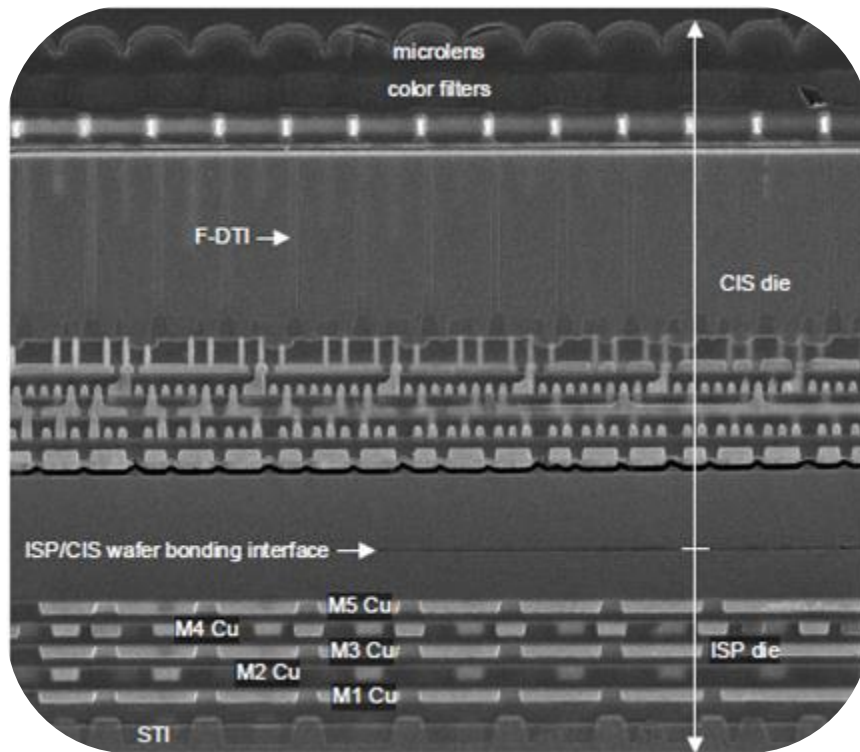


**OmniVision OV23850 23.8 MP
PureCel-S CIS**

Available Stacked Image Sensor Reports

- 2013
 - **Sony ISX014** (IPR-1302-801)
 - **Sony Xperia Z1** (DEF-1311-804)
 - **Sony iPhone 5S** (DEF-1311-805)
- 2014
 - **Sony IMX135** (DEF-1404-803)
 - **Sony iPhone 6 Plus iSight** (DEF-1409-802)
 - **Sony iPhone 6 Plus FaceTime** (DEF-1409-803)
 - **Sony Galaxy S5 LTE-A** (DEF-1410-801)
 - **Sony IMX214** (IPR-1503-901)
- 2015
 - **OmniVision OV23850 (IPR-1509-802)**
 - **OmniVision OV23850** (DEF-1508-802)
 - **OmniVision OV13860** (DEF-1508-804)
 - **Samsung S5K3P3SX (IPR-1509-801)**
 - **Samsung S5K3M2** (DEF-1507-801)
 - **Sony IMX240** (DEF-1504-803)
 - **Sony IMX278** (IPR-1505-801)
 - **Sony IMX234 LG G4** (DEF-1506-802)
 - **Sony IMX240** (DEF-1504-803)
 - **Sony RX100IV** (DEF-1508-805)
 - **Sony iPhone 6S FaceTime** (DEF-1509-804)
 - **Sony iPhone 6S iSight** (DEF-1509-803)
- 2016
 - **Sony IMX300 from Xperia Z5** (DEF-1511-802)

Samsung S5K3P3SX (IPR-1509-801)

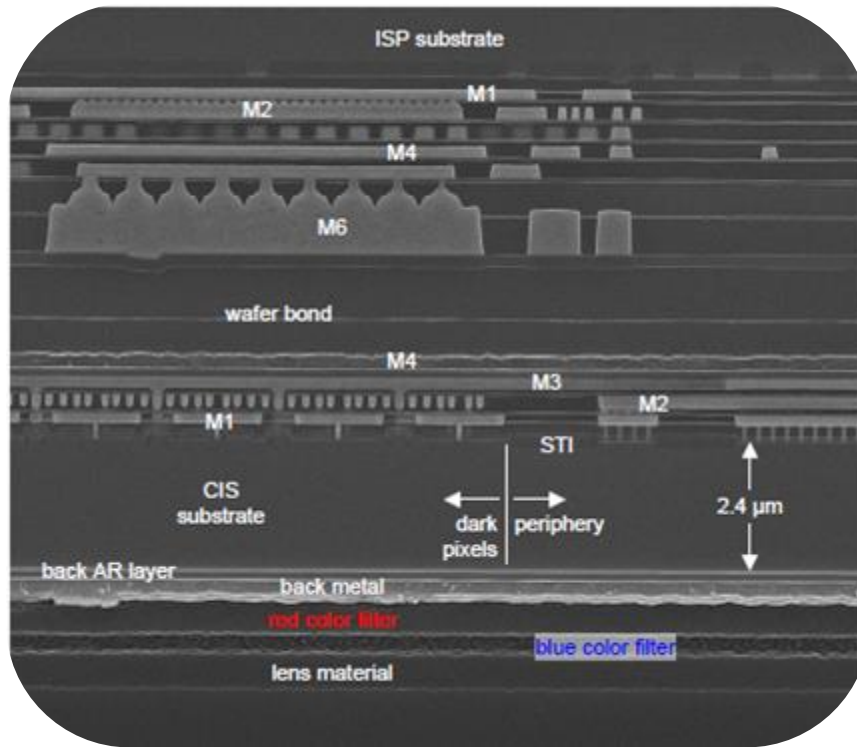


Samsung S5K3P3SX ISOCELL General Structure (Active Pixels)

Selected Device Highlights

- H2 2015: first known design win of Samsung 1.0 μm generation CMOS image sensor (CIS)
- First generation Samsung stacked CIS technology
- Samsung's second generation of ISOCELL; now full-depth, front deep trench isolation (F-DTI)
 - Previously analyzed ISOCELL structures were partial back-DTI (B-DTI)
- Vertical transfer gates (VTG) in use for active pixel array
- CIS die is face-to-face (F2F) bonded to a 65 nm Samsung image signal processor (ISP) die and connected with W-based through-silicon-via (TSV) arrays
- The CIS die is fabricated by Samsung in a 65 nm CMOS process, featuring five levels of Cu interconnect
- And much more...

OmniVision OV23850 (IPR-1509-802)



OmniVision OV23850 PureCel-S General Structure
(Dark Pixel/Periphery Transition Region)

Selected Device Highlights

- First generation OmniVision stacked CIS technology
 - Fabricated with foundry partner XMC
- The OV23850 features an embedded (buried) color filter array (CFA) and on-chip phase detection autofocus (PDAF) pixel array
- The CIS die is wafer bonded to the ISP die, which features six layers of Cu metal.
- The CIS and ISP chips are connected through Cu-based TSV arrays
- And much more...

Available Reports

Chipworks Report	Date	Links
Samsung S5K3P3SX Imager Process Review (IPR-1509-801) <ul style="list-style-type: none"> Provides a thorough cross-sectional analysis of the general logic and pixel to help understand how the sensor is fabricated Focuses on key image sensor elements: Microlenses, Color filters, Pixel architecture, Photocathode, etc. 	Available	Call for pricing Table of Contents»
OmniVision OV23850 Imager Process Review (IPR-1509-802) <ul style="list-style-type: none"> Provides a thorough cross-sectional analysis of the general logic and pixel to help understand how the sensor is fabricated Focuses on key image sensor elements: Microlenses, Color filters, Pixel architecture, Photocathode, Phase Detection Pixel Array, etc. 	Available	Call for pricing Table of Contents»
Sony IMX278 Imager Process Review (IPR-1505-801) <ul style="list-style-type: none"> Provides a thorough cross-sectional analysis of the general logic and pixel to help understand how the sensor is fabricated Focuses on key image sensor elements: Microlenses, Color filters, Pixel architecture, Photocathode, Phase Detection Pixel Array, etc. 	Available	Call for pricing Table of Contents»
Sony IMX214 Imager Process Review (CAR-1504-901) <ul style="list-style-type: none"> Circuit Analysis reports are delivered in ICWorks Browser which includes: <ul style="list-style-type: none"> Multi-layer image set Schematics Cross Probing 	Available	Call for pricing Table of Contents»

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Recent Analysis Summary from Chipworks Senior Technology Analysts (tri-annually)



Annual onsite seminar delivered by Chipworks' Image Sensor Sector Analyst – an important opportunity to ask an unlimited number of questions



Noteworthy Patents Summary (tri-annually)

Thank You

Our experienced engineers and analysts deliver top-notch investigative results. You can expect a comprehensive, factual, and detailed report which will give you a solid understanding of your product and market position, and more importantly – your market potential.

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hiqbal@chipworks.com

www.chipworks.com