

# Reverse Costing® CATALOGUE

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MEMS

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PACKAGING

SYSTEM

POWER

## REVERSE COSTING®

A complete set of information to understand the technology and cost of the electronic devices on the market. System Plus Consulting Reverse Costing® reports are based on in-house developed methodology and costing tools which ensure their single format. The full collection is regularly updated on our website. These reports can be ordered individually or under our Annual Subscription.

## IMAGING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>VISIBLE</b>				
SP18387	2018/3 100	ams Apple iPhone 8	Color Sensor in the Apple iPhone 8	Full analysis of the package and sensor die, cost analysis and price estimate for the device. Comparison with the ams TCS3400.
SP18385	2018/5 102	ams AS726X Series	Color Sensor	Full analysis from sensor die to packaging along with a cost analysis and a price estimate for the device.
SP18355	2018/7 115	Hamamatsu C12880MA	C12880MA Micro-spectrometer	Detailed physical analysis with process description and manufacturing cost analysis
SP17377	2017/12 99	ams Apple iPhone X	Multi-Spectral Sensor	Analysis of the complete multi-spectral ALS, from the sensor die to the custom packaging developed for the device. Complete cost analysis and a price estimate for the device
SP17348	2017/11 350	Various	Camera Module	Explanation of the main players' technology choices and comparison between competitors.
SP17343	2017/7 130	Sony IMX400	22MPix tri-layer stacked CIS	The first tri-layer stacked CIS on the market includes a 22 Mpixel array, a 1Gb DRAM die and a digital signal processor (DSP) on the same die footprint.
SP17338	2017/8 122	Samsung Galaxy S8	Iris Scanner	Description of the supply chain of the full system including the IR camera module, CIS and infrared LED. Comparison with the Fujitsu iris.
SP17334	2017/6 94	NanoLambda NSP32-V1	Nano Spectrometer	First plasmonic filter sensor for consumer devices could disrupt optical applications
SP17326	2017/3 113	STMicroelectronics iPhone7	Time of Flight Proximity Sensor	A look inside Single Photon Avalanche Diode (SPAD) Technology from STMicroelectronics entering the High-End Apple Handset
SP17304	2017/3 165	Consumer Physics Scio	Spectrometer	World's first pocket size Molecular sensor that can be integrated into consumer smartphones
<b>OTHER</b>				
SP19440	2019/1 300	Various	Mobile Camera module	Analysis of rear and front-facing CCMs including standard mono modules, dual modules, iris scanners, 3D camera modules and triple modules
<b>INFRARED</b>				
SP19488	2019/2 140	Valeo SCALA	Valeo SCALA Laser Scanner	Based on a complete teardown analysis of the LiDAR, the report provides the bill-of-material (BOM) and the manufacturing cost of the LiDAR sensor
SP19431	2019/3 300	Various Mobile CMOS Image Sen	Comparison 2019	Analysis of the CIS dies integrated in rear and front-facing CMOS Camera Modules including main cameras, wide angle, telephoto and near global shutter infrared.
SP19424	2019/2 180	Huawei Mate 20 Pro	3D Depth-Sensing System	Full analysis of the NIR camera module and the dot projector, along with a cost analysis and price estimate for the system
SP19403	2019/3 147	Sony IMX316	3D Time-of-Flight	Complete 3D depth sensing system physical analysis and cost and estimation of the price.

# IMAGING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP18438	2018/12 160	<b>Mantis</b> Xiaomi Mi8 Explorer	3D Depth Sensing System	Analysis of the complete 3D depth sensing system, including a complete analysis of the NIR camera module, and the dot projector. cost analysis and price estimation for the system
SP18434	2018/11 170	<b>Orbec</b> Oppo Find X	3D Depth Sensing System	Complete analysis of the 3D depth sensing system, including a complete analysis of the NIR camera module, the dot projector and the SoC.
SP18405	2018/8 200	<b>Samsung &amp; Apple</b> Various	ALS & Proximity Sensor	Analysis of the packaging and the sensor die along with a cost analysis calculation for three smartphone generations: Galaxy S7, S8 and S9 and iPhone 7, 8 and X.
SP18404	2018/5 90	<b>Intel</b> RealSense D435	3D Active IR Stereo Depth Camera	Complete teardown analysis of the RealSense D435, with high definition pictures of the vision processor, VCSEL IR projector and image sensor dies and the BOM.
SP18396	2018/4 121	<b>Heimann Sensor</b> HTPA32x32d	32 x 32-array thermopile LWIR	Detailed teardown and cost analysis of the thermopile die, the silicon lens, the EEPROM die, and the packaging.
SP18383	2018/1 172	<b>STMicroelectronics</b> Apple iPhone X	TOF Proximity Sensor & Flood Illuminator	Complete analysis of the microsystem, from the two illumination devices (VCSEL) to the collector (based on the SPAD developed by STMicroelectronics).
SP17378	2017/12 97	<b>STMicroelectronics</b> Apple iPhone X	Camera Sensor	Analysis of the complete NIR camera sensor (module and the sensor die) and cost analysis and a price estimate of the device.
SP17376	2017/12 150	<b>Apple</b> iPhone X	Infrared Dot Projector	Description of the full system's technology and manufacturing process, including the package, VCSEL, electronics, the folded optic and the DOE.
SP17349	2017/9 170	<b>FLIR</b> Boson	Camera and 12µm microbolometer	Detailed teardown and cost analysis of the microbolometer, lens and WLP. bill-of-material (BOM) of the camera core, and manufacturing cost of the infrared camera.
SP17337	2017/7 79	<b>Texas Instrument</b>	Time of Flight Image Sensor	A look into Texas Instruments' system-on-chip, including Sony/Softkinetic's time-of-flight pixel technology, for industrial applications
SP17336	2017/7 80	<b>Melexis</b> MLX75023	ToF imager	A cutting-edge ToF imager technology from Sony/Softkinetic, adapted by Melexis for automotive in-cabin applications
SP17330	2017/6 203	<b>Autoliv</b> ISC0901	Night Vision Automotive Camera	Autoliv's 3rd Generation Automotive Night Vision Camera with FLIR's ISC0901 Microbolometer
SP17305	2017/1 170	<b>Lenovo</b>	3D Time of Flight (ToF) Camera	World's first 3D tri-camera bundle including Infineon/pmd REAL3TM ToF image sensor integrated into a consumer smartphone

# INTEGRATED CIRCUITS

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>OTHER</b>				
SP18427	2018/9 112	<b>Various</b> Bluetooth 5	System-on-Chip Comparison 2018	Complete cost analysis and a cost estimation of the SoCs. Exhaustive comparison between the studied samples.
SP17335	2017/8 146	<b>Various</b> Bipolar-CMOS-DMOS	BCD Technology & Cost review	Details on the manufacturing process and materials used, estimation of the cost structure highlighting the influence of the technological innovations.

# MEMORY

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>3D NAND</b>				
SP18422	2018/12 245	<b>Various</b> 3D NAND Memory	Leading-edge 3D NAND Memory Comparison	Detailed study of the latest NAND dies and die cross-section and processes. Detailed physical analysis, highlighting the cell design and memory storage type.

# MEMS & SENSOR

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>PRINTHEADS</b>				
SP18421	2018/9 150	<b>Xaar</b> 1201 GS2p5 PZT	Xaar 1201 GS2p5 PZT Printhead	Insight into technological data, manu-facturing cost, and selling price of the MEMS inkjet manufactured by Ricoh and the 1201 printhead supplied by Xaar
SP18420	2018/9 158	<b>Epson</b> PrecisionCore	Printhead with MicroTFP Inkjet Dies	Insight into technological data,manufacturing cost, and selling price of the microTFP inkjet MEMS and the PrecisionCore printhead by Epson.
<b>PRESSURE SENSOR</b>				
SP18385	2018/5 160	<b>Various</b> MEMS Pressure Senso	MEMS Pressure Sensor Comparison 2018	Multiple comparisons based on physical analyses of 34 MEMS pressure sensor components
SP17358	2017/11 108	<b>Bosch</b> BMP380	Digital Barometric Pressure Sensor	Deep technological and cost analyses of the BMP380. Technical and price comparison with the LPS22HB from STMicroelectronics and Bosch BME280 and BME680.
SP17308	2017/2 104	<b>Infineon</b> DPS310	Capacitive Pressure Sensor	Tiny MEMS digital barometer for smartphones and wearables
<b>PHOTONIC</b>				
SP19407	2019/3 200	<b>Intel</b> PSM4 QFSP28	Silicon photonic die	Exhaustive analysis of the main components of the Intel 100G PSM4 connector along with a cost analysis and price estimate.
<b>MICROPHONE</b>				
SP18384	2018/3 215	<b>Various</b> Apple iPhone X	iPhone X – MEMS Microphones	Complete teardown and comparison between each supplier.
SP17314	2017/2 109	<b>Vesper</b> VM1000	Piezoelectric Microphone	Disruptive first Piezoelectric MEMS microphone for consumer applications.
SP16296	2016/10 106	<b>Goertek</b> iPhone7 Microphone	MEMS Microphone iPhone 7	Goertek MEMS Microphone (Infineon solution) in Apple iPhone 7 Plus
SP16294	2016/10 106	<b>STMicroelectronics</b> iPhone7 Microphone	MEMS Microphone iPhone 7	STMicroelectronics MEMS Microphone in Apple iPhone 7 Plus
SP16292	2016/10 113	<b>Knowles</b> iPhone7 Microphone	MEMS Microphone iPhone 7	Knowles MEMS Microphone in Apple iPhone 7 Plus
<b>MEDICAL</b>				
SP17346	2017/7 130	<b>Thermo Fisher</b> Ion 520	Sequencing chip	Complete analysis of the Ion 520 chip from Thermo Fisher, featuring chip disassembly and die analyses, processes and cross-sections.
<b>IMU/COMBO</b>				
SP19443	2019/1 102	<b>Honeywell</b> HG1120CA50 9-Axis	MEMS Inertial Sensor	Detailed physical analysis with a process description and manufacturing cost analysis, as well as a full comparison with the Sensoror STIM210 and the ADIS16460.
SP19442	2019/1 161	<b>Honeywell</b> HG4930CA51 6-Axis	MEMS Inertial Sensor	Detailed physical analysis with a process description and manufacturing cost analysis, as well as a full comparison with the Sensoror STIM210 and the HG1120CA50.
SP18382	2018/1 190	<b>Bosch</b> 6-Axis IMU	6-Axis IMU in the Apple iPhone X	Physical analysis, with process description and manufacturing cost analysis. Comparison with Bosch Sensortec's BMI160, InvenSense and STMicroelectronics' latest 6axis IMUs.
SP17361	2017/10 175	<b>InvenSense</b> ICM-20789	Pressure Sensor Combo	Detailed technology and cost analysis of the ICM-20789 7-axis motion tracking device. Comparison with the previous generation of combo sensors from InvenSense
SP16297	2016/12 155	<b>STMicroelectronics</b> LSM6DSM	6-axis IMU dedicated to OIS	Complete reports and comparison of the latest generation of inertial measurement units for consumer optical image stabilization applications
SP16291	2016/12 136	<b>InvenSense</b> iPhone 7 Plus	6-axis IMU	Complete reports and comparison of the latest generation of inertial measurement units for consumer optical image stabilization applications
<b>GYROSCOPE</b>				
SP18381	2018/1 141	<b>Tronics Microsystems</b> GYPRO3300	Angular Rate Sensor	Analysis of the complete component, including the package, MEMS, and ASIC dies description of the ASIC and MEMS functionalities.
SP16299	2016/11 87	<b>Invensense</b> IDG-2030	Gyroscope fo OIS	2-axis thin gyroscope for camera OIS

# MEMS & SENSOR

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>FINGERPRINT</b>				
SP18419	2018/7 125	<b>Synaptics and Goodix</b> VIVO X21	Synaptics' Under-Display Fingerprint Scanner Inside the VIVO X21 UD	Comparison with the latest Huawei FPC1268 fingerprint touch sensor and a physical comparison with the Goodix Version of Vivo's fingerprint scanner
SP17318	2017/4 115	<b>Fingerprint Cards</b> FPC1228	Capacitive under glass fingerprint sensor	Huawei P10 and Mate 9 pro capacitive fingerprint successfully integrated under glass in collaboration with TPK
<b>ENVIRONMENT</b>				
SP18398	2018/10 150	<b>Various</b>	Miniaturized Gas Sensor	Comparison 2018 : Analysis of the packaging and the sensor die along with a cost analysis for all devices.
SP18372	2018/2 125	<b>Sensirion</b> SGP30	SGP30 Gas Sensor	Analysis of the entire component, including the package, MEMS, and ASIC die. Full description of the ASIC and MEMS functionalities as well as manufacturing processes.
SP17342	2017/7 152	<b>Bosch</b> BME680	Environnement Sensor	The world's first environmental sensor combining gas, pressure, humidity and temperature sensing functions in a 3mm x 3mm footprint package.
<b>COMPASS</b>				
SP15222	2015/10 160	<b>eCompass Review</b>	3-Axis & 6-Axis	Over 20 eCompasses from the main players analyzed and compared !
<b>ACCELEROMETER</b>				
SP17315	2017/3 130	<b>mCube</b> MC3672	WLCSP MEMS Accelerometer	Ultra-low power - Highly integrated WLCSP Accelerometer with Via-Middle TSV
SP17269	2017/1 110	<b>Safran Colibrys</b> VS1000	High End Accelerometer	Single-Axis High Performance Accelerometer with new ASIC design

# PACKAGING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>OTHER</b>				
SP18430	2018/11 160	<b>Various</b> Wafer	Wafer to Wafer Permanent Bonding	Analysis of each component's wafer bonding process, including component dimensions, cost and manufacturing approach.
<b>EMBEDDED</b>				
SP17306	2017/6 90	<b>TDK</b> SESUB-PAN-T2541	Embedded die bluetooth module	TDK SESUB-PAN-D14580 Module: world's smallest Bluetooth 4.1 low energy (LE)
<b>3D PACKAGING</b>				
SP19439	2019/1 200	<b>Apple</b> Series 4	Apple Watch	Complete analysis of the SiP, featuring die analyses, packaging processes and cross-sections.
SP18444	2018/11 127	<b>Samsung</b> Exynos 9110	Samsung Exynos 9110 with Eplp	Complete analysis of the SiP FO-PLP, featuring die analyses, processes and package cross-sections.
SP18417	2018/10 160	<b>Intel</b>	EMIB	Complete physical analysis of the packaging process, with details of all technical choices regarding processes, equipment and materials.
SP18406	2018/6 130	<b>Samsung, Qualcomm</b>	Samsung's Galaxy S9 + Processor Packages	Review of the Exynos 9810 and the Snapdragon 845, including a complete package analysis, cost analysis, and price estimate for the chips.
SP18393	2018/7 157	<b>Qualcomm</b> WiGig Chips	Qualcomm WiGig Chipset Smartphone	Full investigation of the system, featuring a detailed study of the SiPs and the antenna board including die analyses, processes and board cross-sections
SP18374	2018/1 145	<b>Qualcomm</b> QCA9500	WiGig Chipset	Full investigation of the module, featuring a detailed study of the SiP and the antenna board including die analyses, processes and board cross-sections.
SP18373	2018/2 140	<b>TSMC</b> Apple A11 inFO PoP	inFO Packaging in iPhone X	Analysis of the packaging from the DRAM memory to the LSC developed by TSMC. Comprehensive cost analysis and price estimation of the device.

# PACKAGING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP17360	2017/11 130	<b>AMD</b> Radeon Vega	SPIL CoW last – Samsung HBM2	Complete physical analysis of the packaging process. Comparison with NVIDIA's Tesla P100 and AMD's Fury X.
SP17353	2017/10 130	<b>TSMC, Samsung</b> NVIDIA Tesla P100	GPU accelerator with HBM2	Complete physical analysis of the packaging process, description of the manufacturing supply chain and calculation of the manufacturing costs.
SP17352	2017/10 300	<b>Various</b> MEMS Packaging	Mems Packaging	Multiple comparisons based on physical analyses of over 100 MEMS components.
SP17339	2017/6 133	<b>NXP</b> SCM-i.MX6	Quad High Density Fan-Out Wafer-Level SiP	NXP SCM-i.MX6 Quad High Density Fan-Out Wafer-Level System-in-Package
SP16303	2016/12 100	<b>Various</b>	Application Processors Comparison	Comparison of main players AP: Apple A10 with inFO vs. Qualcomm Snapdragon 820 with MCePpackaging technology vs. HiSilicon Kirin 955 & Samsung Exynos8 with standard PoP
SP16276	2016/6 113	<b>Qualcomm</b> Snapdragon 820	Package-on-Package	The Galaxy S7 integrates the Exynos 8 with classic PoP packaging or the Snapdragon 820, with Molded Core Embedded Package (MCeP) technology, developed by Shinko.

# PASSIVE

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>OTHER</b>				
SP17344	2017/9 140	<b>Various</b> Silicon Capacitor	Silicon Capacitor	Details on the manufacturing process and materials used, component design, and die size. Comparison of the components' sizes, materials and characteristics.
SP16300	2016/10 100	<b>TSMC</b> Silicon Capacitor	Deep Trench Capacitor	Deep analysis and Reverse Costing of the new silicon capacitor technology from TSMC used for the latest Apple's Application processor, the A10 found in the iPhone 7

# POWER

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>SiC</b>				
SP18428	2018/8 95	<b>Rohm</b> Gen3 Trench	Rohm SiC MOSFET Gen3 Trench Design Family	Analysis of the Gen3 trench MOSFETs at 650V and 1200V, with optical and scanning electron microscope (SEM) images of the complex SiC trench structure.
SP18413	2018/6 100	<b>STMicroelectronics</b> Tesla Model 3	Tesla Model 3 Inverter with SiC Power Module	Estimation of the production cost of the SiC MOSFET and package. Technical and cost comparison with the Mitsubishi J-Series TP-M power module.
SP18410	2018/6 74	<b>UnitedSiC</b> UJN1205K	1200V SiC JFET	Analysis of the UJN1205K device, assembled in a TO247 package as well as production cost analysis, and comparisons with its JFET counterpart from SemiSouth
SP18390	2018/4 55	<b>Littelfuse</b> LSIC1MO120E0080	SiC MOSFET	Complete BoM, die manufacturing, and packaging processes. Estimated manufacturing cost, a comparison with similar products from STMicroelectronics and CREE.
SP18366	2018/2 140	<b>Infineon</b> >F11MR12W1M1_B11	1200V CoolSiC MOSFET Module	Full teardown of the module's components and housing.
SP17310	2017/4 65	<b>Rohm</b> SCT2H12NZGC11	1700V SiC MOSFET	In its new series of SiC MOSFETs, Rohm uses trench structures for 650V and 1200V products, while 1700V products use planar structures
SP17309	2017/1 66	<b>STMicroelectronics</b> STC30N120	1200V SiC MOSFET	The 1st generation 1200V SiC MOSFET device from STMicroelectronics has good current density at a very competitive cost
<b>OTHER</b>				
SP18399	2018/7 110	<b>Various</b>	Automotive Power Module Packaging	Comparison 2018 of the structures and costs of the different technological choices made by key manufacturers of the automotive industry
SP18359	2018/5 115	<b>Various</b>	Power Discrete Packaging	Comparison 2018 : Summary of the state of the art of packaging power semiconductors at a discrete level. Comparison of 20 types of packages.
<b>MOSFET</b>				
SP18380	2018/1 75	<b>Wolfspeed</b> C2M0025120D	1200V SiC MOSFET	Deep technology analysis of the package and components, with images of the planar SiC structure. Comparisons with Rohm and ST SiC MOSFETs and 1200V silicon IGBTs.

# POWER

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP17350	2017/8 335	Various 100V MOSFET	100V MOSFET Comparison	Details on the manufacturing processes and materials used, packaging structures, component designs, die sizes, electrical performance and current densities, and cost structure
SP17333	2017/6 70	ON Semiconductor FDMS86181	100V 124A Trench MOSFET	The newest technical innovations in the device and package made by ON Semiconductor/Fairchild
<b>IGBT</b>				
SP19455	2019/3 140	ABB 5SNG 1000X170300	Power Module	Insights into the structure, technical choices, design, processes, and supply chain positions. Manufacturing cost of the module's components and analyses its selling price.
SP18408	2018/10 185	Mitsubishi J1- Series 650V	Mitsubishi J1- Series 650V	Technology and cost analysis of two J1-series power modules with 650V and 600A/1000A: the CT600CJ1A060 and the CT1000CJ1B060
SP18388	2018/9 225	Various 1200V	1200V Silicon IGBT vs SiC MOSFET	Comparison 2018 with design information, estimated production cost for every transistor and comparison of the different components available on the market
SP18375	2018/1 115	Infineon FF400R07A01E3	Double Side Cooled IGBT Module	Estimation of the production cost of the IGBT, diode and package and technical and cost comparison between Infineon's design and the Toyota Prius inverter's DSC power module
SP17332	2017/6 87	Infineon FS820R08A6P2B	750V IGBT Module	The HybridPACK™ Drive is a very compact power module optimized for hybrid and electric vehicle.
SP16288	2016/12 195	Various	IGBT vs SiC MOSFET comparison	1200V SiCMOSFET vs Silicon IGBT: Technology and cost comparison
<b>GaN</b>				
SP18411	2018/10 110	Qorvo QPF4006 39GHz	Qorvo QPF4006 39GHz GaN MMIC	Detailed analysis of the packaging and the GaN on SiC transistor with optical SEM Pictures as well as a cost analysis.
SP18391	2018/6 97	GaN Systems GS61004B	100V GaN HEMT	Estimated production cost for the epitaxy and the package. Comparison of the standard 100V Si MOSFETs and low-voltage GaN on Si HEMT.
SP18365	2018/4 200	Various	GaN-on-Silicon Transistor Comparison	Estimated production cost for the integrated circuit gate driver, transistor, and package. Comparison of the different components available on the market.
SP18363	2018/2 100	Texas Instruments LMG5200	80V GaN FET Power Stage	Estimated production cost for the IC gate driver, FET, and package. Comparison with the packaging and epitaxy from GaN Systems, Transphorm, and Panasonic.
SP17362	2017/9 82	EPC EPC2045	100V GaN-on-silicon Transistor	Estimation of the production cost of the epitaxy and the package, comparison with previous EPC devices and epitaxy.
SP17331	2017/7 104	Texas Instruments LMG3410	600V GaN-on-Silicon HEMT	The LMG3410 Single-Channel Gallium-Nitride (GaN) Power Stage contains a 70-mΩ, 600-V GaN power transistor and specialized driver in an 8-mm by 8-mm QFN package.
SP17322	2017/5 72	Panasonic PGA26E19BA	600V GaN-on-Silicon HEMT	Panasonic abandons the TO220 package for its GaN HEMTs and proposes the DFN 8x8 package for the latest 600V device.
SP17319	2017/5 98	Transphorm TPH3208PS	650V GaN HEMT	A new 650V GaN HEMT from Transphorm with a simplified cascode structure and enhanced electrical characteristics.
SP17311	2017/2 78	Panasonic PGA26C09	600V GaN-on- SiliconHEMT	The first 600V GaN HEMT of Panasonic is designed with an innovative structure to integrate a normally Off transistor in a standard package without cascode.

# RF

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>RF MODULE</b>				
SP18389	2018/4 600	Various	RF Front-End Modules Comparison 2018	Description of each component and statistical analyses for most front-end modules.
SP18379	2018/2 160	Broadcom AFEM-8072	Mid&High Band LTE FEM	Analysis of the full FEM SiP, including the RF IC and its IPDs, the filtering dies and the internal and external EMI shielding.
SP18368	2018/10 397	Various Automotive Radar	Automotive Radar	Comparison 2018 : Description of each component and statistical analyses for most radar systems focusing on the RF board.

# RF

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP17364	2017/11 140	Various	RF SiPs	Description of each component and important data, including type of substrate, proportion of silicon in the module and line spacing.
<b>RF IC</b>				
SP18418	2018/8 150	Peraso X710	Peraso X710 Chipset 60GHz	Full investigation of the system, with a detailed study of the baseband processor, the RFIC and the antenna board including die analyses, processes and board cross-sections.
SP18394	2018/4 85	Texas Instruments AWR1642	77 & 79 GHz RF CMOS Radar Chipset	Single-chip radar (76 - 81 GHz) in an SoC device featuring MCU and DSP
<b>RF FILTER</b>				
SP17327	2017/5 122	Taiyo Yuden	SAW and BAW Band 7 Duplexer	Taiyo Yuden's Well-Proven Metal Seal Packaging and SAW/BAW technology in LTE Band 7 high isolation duplexer used in Skyworks' PAMiD
SP16283	2016/8 93	Murata FAJ15	SAW filter	The Samsung Galaxy S7 smartphone is the latest one to integrate Murata's front-end module with the FAJ15, featuring Murata's thermo-compensated technology
<b>OTHER</b>				
SP17328	2017/12 300	Various RF IPD	RF Integrated Passive Devices	Description of each component, its major characteristics (substrate type (GaAs, silicon, glass), passivation layers, passive integration, etc.) and a comparison of all devices.
SP19445	2019/2 167	Broadcom AFEM-8092	Apple iPhone Xs/Xr Series	Complete analysis of the FEM SiP, including an analysis of the matching IC, the filtering dies, the internal and external EMI shielding and the Power Amplifier.
SP19400	2019/1 159	Ainstein & Calterah	Ainstein K-77 & Calterah CAL77A2T4R	BOM and the manufacturing cost of the radar sensor and review of the CAL77A2T4R transceiver, with a complete die analysis, cost analysis, and price estimate of the chips.

# SOLID STATE LIGHTING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>WHITE/BLUE LED</b>				
SP17317	2017/3 70	Samsung LM101A	Chip Scale Package LED	The first Samsung Chip Scale Package LED is developed according to technical choices to reduce the manufacturing cost.
<b>UV LED</b>				
SP16273	2016/6 170	SETi UVTOP270TO39HS	UV LED	The UVTOP270TO39HS and SS35DF227513 are two 275nm UVC LEDs from Sensor Electronic Technology Inc. (SETi).
SP16272	2016/6 115	Crystal IS OPTAN280K-BL	UV LED	The OPTAN280K-BL and OPTAN-265N-SMD are two UVC LEDs, of 280nm and 265nm respectively, from Crystal IS.
SP19426	2019/4 190	Various VCSEL	Comparison 2019	Complete cost analysis and a cost estimate of the VCSEL

# SYSTEM

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>ENERGY</b>				
SP17307	2017/1 81	Enphase S280	Solar microinverter	Best in class SmartGrid-ready 280VA inverter with new generation ASIC-based topology for lighter design and enhanced solar power management
<b>CONSUMER</b>				
SP17325	2017/3 132	Oculus Rift	Virtual Reality Head- Mounted Display	Detailed analysis of Oculus's HMD for VR experience



# SYSTEM

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP17280	2017/2 131	<b>HTC</b> Vive	VR Head-Mounted Display	HTC Vive Virtual Reality Head-Mounted Display

## AUTOMOTIVE

SP18432	2018/10 103	<b>Aptiv</b> SRR3	Aptiv's Third Generation of 77 GHz-Radar (SRR3)	Bill-of-material (BOM) and the manufacturing cost of the radar sensor, as well as a complete physical analysis of the MMIC
SP18401	2018/9 57	<b>Ainstein</b> T-79	Ainstein T-79: Automotive 79GHz Radar	Complete teardown analysis with the bill-of-material (BOM) and the manufacturing cost of the radar sensor
SP18386	2018/3 80	<b>Continental</b> SRR3-B	Continental SRR3-B Blind Spot Radar	Complete teardown analysis including BOM and manufacturing cost.
SP17357	2017/10 76	<b>Continental</b> SRL1	Short Range Lidar	Details on the full Continental SRL1 system's manufacturing and packaging processes, estimation of the manufacturing cost and selling price.
SP17354	2017/8 64	<b>Bosch</b> Ultrasonic sensor	Ultrasonic Sensor	Bill-of-material(BOM) and manufacturing cost physical analysis and manufacturing cost estimation of the Bosch transceiver IC.
SP17340	2017/6 35	<b>LG</b> LG LA080WV3	Display with Touch Panel for Car Navigation	LG LA080WV3 – 8-inch Display with Touch Panel for Car Navigation
SP17329	2017/4 80	<b>Continental</b> MFC430	Forward Automotive Camera	Continental attempts to penetrate the forward camera market with a distinctive architecture and cost effective solution
SP17324	2017/4 62	<b>Bosch</b> MPC2	Forward Automotive Camera	Bosch attempts to penetrate the forward camera market with a distinctive architecture and cost effective solution
SP17323	2017/4 77	<b>TRW</b> S-Cam3	Forward Automotive Camera	Third and latest version of TRW's best-selling S-Cam series forward camera
SP17321	2017/3 85	<b>Continental</b> ARS4A	77GHz Radar	Simultaneous long and short range 77GH7 radar
SP17320	2017/4 192	<b>Leddartech</b> LeddarVU	solid state high-definition LiDAR module	Without moving part, smallest form factor on the market and integrating the latest solid state technology, the LeddarVU8 is ready to compete with radars.
SP17313	2017/4 88	<b>Bosch</b> LRR4	77GHz Long Range Radar Sensor	The fourth generation of Bosch long range radar sensor set new boundaries for a more elegant, compactness and cost effectiveness module

# TEARDOWN

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP18437	2018/11 60	<b>Xiaomi</b> Mi 8 Explorer	Xiaomi Mi8 Explorer Teardown	Teardown photos, detailed package identification and descriptions.
SP18435	2018/10 60	<b>Oppo</b> Oppo Find X	Oppo Find X Teardown	Teardown photos, detailed package identifications and descriptions. Excel file summarizing the Oppo Find-X chipset and the distributions.
SP18412	2018/5 50	<b>Huawei</b> P20Pro	Huawei P20 Pro	Teardown photos,detailed package identifications and descriptions. Excel file summarizing the P20 Pro chipset and breaking down the devices by supplier,packages.

<b>Headquarters</b> 22 bd Benoni Goullin 44200 Nantes, <b>FRANCE</b> T : +33 2 40 18 09 16 sales@systemplus.fr	<b>Europe Sales Office</b> Lizzie LEVENEZ Frankfurt am Main <b>GERMANY</b> T : +49 151 23 54 41 82 llevenez@systemplus.fr	<b>America Sales Office</b> Steve LAFERRIERE <a href="mailto:laferriere@yole.fr">laferriere@yole.fr</a> T : +1 310 600 2867 Troy BLANCHETTE <a href="mailto:troy.blanchette@yole.fr">troy.blanchette@yole.fr</a> <b>USA</b>	<b>Asia Sales Office</b> Takashi ONOZAWA Tokyo <b>JAPAN</b> T : +81 3 4405 9204 onozawa@yole.fr	<b>Greater China Office</b> Mavis WANG Taipei <b>TAIWAN</b> T :+886 979 336 809 wang@yole.fr
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