

# Reverse Costing® CATALOGUE



## 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.
<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
SP19468	2019/9 147	pmd/Infineon	pmd/Infineon's 3D Indirect Time-of-Flight in LiDAR	Analysis of the complete 3D indirect ToF camera, provided along with cost analysis and price estimation for the module.
SP19456	2019/4 144	ams	Direct ToF Proximity Sensor	Complete analysis of the proximity sensor includes detailed analyses of the SPAD detector and the VCSEL, along with a cost analysis and price estimation for the module.
SP19451	2019/5 143	Panasonic 3D ToF	3D ToF camera with flood illuminator	Physical and economic analysis of the 3D depth sensing camera found in the Vivo Nex Dual Display smartphone.
SP19431	2019/3 300	Various	Comparison 2019 mobile CMOS Image Sen	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.
SP18438	2018/12 160	Mantis 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

# IMAGING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
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>FIIR</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.

# INTEGRATED CIRCUITS

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>OTHER</b>				
SP19429	2019/7 100	<b>Melexis</b> MLX90640	Infrared Thermal Sensor	Detailed teardown & cost analysis of the thermopile die where the memory is directly integrated, along with the silicon lens and the packaging.
<b>MEDICAL</b>				
SP19436	2019/6 163	<b>Apple</b> Apple Watch 4	Apple Watch 4's PPG and ECG Health Sensors	Analysis of the complete health sensor system, including a full analysis of the infrared LED from Epistar, green LEDs from OSRAM and the photodiodes from OSRAM for the PPG.
SP19462	2019/4 90	<b>Mobileye</b> EyeQ4	Vision Processor Family	Exhaustive comparison between the EyeQ4®-High and -Mid versions and the previous EyeQ3®, highlighting the improvements, similarities and differences.
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>				
SP19489	2019/9 100	<b>Samsung</b>	3D V-NAND 92-Layer Memory	Detailed technology study WITH details of die cross sections and material identification, Detailed process and manufacturing price estimation also included.
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.
SP19483	2019/12 240	<b>Various</b>	3D NAND Memory Comparison 2019	Detailed study of the latest 96-layer technology from Toshiba and SanDisk, 92-layer technology from Samsung, 72-layer technology from SK Hynix and 96-layer technology from Micron

# MEMORY

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP19466	2019/11 170	Various	LPDDR4 Memory Comparison 2019	Full teardowns of the packages and LPDDR4 dies to unveil the technology and process employed by each manufacturer.

# MEMS & SENSOR

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
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## PRINTHEADS

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.

## PRESSURE SENSOR

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.

## PHOTONIC

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.
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## OTHER

SP19491	2019/10 88	<b>USound</b> Achelous UT-P 2016	MEMS Speaker	Technology and cost analysis of the UT-P 2016 MEMS Speaker.Envelope Tracker Module
	2019/8 94	<b>HP</b> 746	HP746 HDNA Inkjet Die	Complete physical & cost analysis of the HDNA ihermal inkjet die from HP. A comparison between HP inkjet die with and without HDNA is included.

## MICROPHONE

SP19491	2019/10 88	<b>Usound</b> UT-P 2016	MEMS Speaker	Technology and cost analysis of the UT-P 2016 MEMS Speaker
SP18384	2018/3 215	<b>Various</b> Apple iPhone X	iPhone X – MEMS Microphones	Complete teardown and comparison between each supplier.

## MEDICAL

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.
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## IMU/COMBO

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

## GYROSCOPE

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.
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# MEMS & SENSOR

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>FINGERPRINT</b>				
SP19506	2019/10 160	<b>Goodix</b>	Under-Display Optical Fingerprint	Insight into technological data, manufacturing cost, and selling price of the fingerprint sensor supplied by Goodix.
SP19472	2019/9 271	<b>Various</b>	Piezoelectric modules	Physical analysis and a cost estimation of the integration of piezoelectric material in a system or wafer.
SP19465	2019/7 127	<b>Qualcomm</b>	3D Sonic Sensor Fingerprint	Analyses of the sensor die and the ASICs along with a cost analysis and price estimation for the module.
SP18419	2018/7 125	<b>Synaptics and Goodix</b> VIVO X21	Synaptics' Under-Display Fingerprint Scanner <i>Inside the VIVO X21 HD</i>	Comparison with the latest Huawei FPC1268 fingerprint touch sensor and a physical comparison with the Goodix Version of Vivo's fingerprint scanner
<b>ENVIRONMENT</b>				
SP20513	2019/1 3990	<b>Sensirion</b> SCD30	NDIR CO2 & Humidity Sensor	Technology and cost analysis that includes study of all the main parts of the sensor : the humidity sensor, the other module parts and the assembly
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.

# 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>				
SP19425	2019/11 124	<b>Qualcomm</b> QET5100M	Envelope Tracker Module	In-depth physical analysis of the envelope tracking module, and a complete description of the manufacturing process flow
<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.
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.

# 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.

# POWER

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>SiC</b>				
SP19494	2019/10 154	<b>Wolfspeed</b> CAB450M12XM3	SiC Module	Estimated manufacturing cost of all the module's components and selling price analysis
SP19467	2019/8 200	<b>UnitedSiC</b>	UnitedSiC Cascode JFET 650V Family	Detailed manufacturing cost analysis of the JFET, the MOSFET and the package as well as the estimated selling price of each one of 5 five cascode components
SP19449	2019/5 289	<b>Various</b> SiC MOSFET	Comparison 2019	Estimated manufacturing cost of the MOSFET devices & analysis of their selling prices. Technological & manufacturing cost comparisons between the analyzed MOSFETs.
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> JF11MR12W1M1_B1	1200V CoolSiC MOSFET Module	Full teardown of the module's components and housing.
<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.
<b>IGBT</b>				
SP19492	2019/10 163	<b>Infineon</b> PrimePACK™2	1200V Power Module with IGBT5 and EC5 Diode	Full teardown of the module's components and housing, as well as stimated manufacturing cost of all the module's components and a selling price analysis
SP19455	2019/3 140	<b>ABB</b> 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	<b>Mitsubishi</b> 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	<b>Various</b> 1200V	1200V Silicon IGBT vs SiC MOSFET	Comparison 2018 wit design information, estimated production cost for every transistor and comparison of the different components available on the market
SP18375	2018/1 115	<b>Infineon</b> 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
<b>GaN</b>				
SP19493	2019/10 108	<b>Macom</b> NPA1008	RF Power Amplifier with GaN-on-Si HEMT	Estimation of the production costs of the HEMT, the passive die, and the package as well as the estimated selling price of the component.

# POWER

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP19480	2019/7 156	<b>Anker</b> SC1933C	GaN-on-Sapphire HEMT Power IC	Teardown analysis of the SC1933C .Estimation of the production costs of the ICs, the HEMT & the package as well as the estimated selling price of the component.
SP19464	2019/5 112	<b>Navitas</b> NV6115 & NV6252	GaNFast Power IC Family	Insights into the HEMT tructure, the epitaxy, technical choices, design, processes, and supply chain positions.
SP19453	2019/7 169	<b>Various</b>	GaN-Based Wall Charger Comparison 2019	Detailed BOM and manufacturing analysis for all the chargers' devices and packages. Different supply chains and the technical choices made by the manufacturers.
SP19415	2019/9 86	<b>EPC</b> EPC2112	HEMT with Monolithic Optimized Gate Driver	Complete teardown analysis and detailed manufacturing cost analysis of the die and the package as well as the estimated selling price of the device,
SP18411	2018/10 110	<b>Qorvo</b> 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	<b>GaN Systems</b> 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	<b>Various</b>	GaN-on-Silicon Transistor Comparison	Estimated production cost for the integrated circuit gate driver,transistor,andpackage. Comparison of the different components available on the market.
SP18363	2018/2 100	<b>Texas Instruments</b> 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	<b>EPC</b> EPC2045	100V GaNon-silicon Transistor	Estimation of the production cost of the epitaxy and the package,comparison with previous EPC devices and epitaxy.
	2019/11 260	<b>Various</b>	GaN-on-Si HEMT vs Superjunction MOSFET Comparison 2019	Detailed pictures of device structures, details on manufacturing processes and materials, comparison of electrical performance, and cost breakdown analysis of the process.
	2019/6 97	<b>Infineon</b> 600V	CoolGaN Transistor	Complete teardown analysis including optical and SEM pictures of metal layers, delayering of the GaN, cross-section of the HEMT part and the diode part of the die.

# RF

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>RF MODULE</b>				
SP19478	2019/10 162	<b>Qorvo</b> QM76018	RFFEM	Complete analysis of the FEM SiP, including the LNA, the filtering dies, the internal and external EMI shielding and the Power Amplifier.
SP19450	2019/7 431	<b>Various</b>	RF Front-End Module Technical Comparison 2019	Study of Front-End Modules and components found in eight flagship smartphones
SP19445	2019/2 167	<b>Broadcom</b> 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.
SP19433	2019/5 81	<b>Acconeer</b> A111 60 GHz	Pulsed Coherent Radar	Review of the A111, including a complete die analysis, cost analysis, and price estimate for the chips. Physical and technical comparison with Texas Instruments' IWR6843AoP
SP19400	2019/1 159	<b>Ainstein &amp; Calterah</b>	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.
SP19392	2019/4 121	<b>Analog Devices</b> ADI ADGM 304/1004	RF MEMS Switch	Detailed physical description of the Analog Devices ADGM1304 along with a cost analysis. physical and cost comparison with the ADGM1001.
SP18389	2018/4 600	<b>Various</b>	RF Front-End Modules Comparison 2018	Description of each component and statistical analyses for most front-end modules.
SP18379	2018/2 160	<b>Broadcom</b> 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	<b>Various</b> Automotive Radar	Automotive Radar	Comparison 2018 : Description of each component and statistical analyses for most radar systems focusing on the RF board.
SP17364	2017/11 140	<b>Various</b>	RF SiPs	Description of each component and important data, including type of substrate, proportion of silicon in the module and line spacing.

# RF

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>RF IC</b>				
SP19482	2019/9 194	<b>Qualcomm</b> SDX50M & QTM052	Qualcomm's First 5G mmWave Chipset	Full investigation of the system, with detailed study of the SiPs, including die analyses, processes and board cross-sections. Complete cost analysis & selling price estimation. System
SP19481	2019/8 100	<b>Texas intruments</b> AWR1843AoP	77/79 GHz Radar Chipset	Complete package and die analysis, cost analysis, and price estimate for the component.
SP18418	2018/8 150	<b>Peraso</b> 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	<b>Texas Instruments</b> AWR1642	77 & 79 GHz RFCMOS Radar Chipset	Single-chip radar (76 - 81 GHz) in an SoC device featuring MCU and DSP
<b>RF FILTER</b>				
SP19454	2019/10 100	<b>Murata</b> IHP	SAW Filter	Complete analysis of the IHP SAW component including analyses of the filter die and the CSP, along with cost analysis and price estimation for the component.
<b>OTHER</b>				
SP17328	2017/12 300	<b>Various</b> 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.

# SOLID STATE LIGHTING

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>VCSEL</b>				
SP19426	2019/4 190	<b>Various</b> VCSEL	Comparison 2019	Complete cost analysis and a cost estimate of the VCSEL

# SYSTEM

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
<b>OTHER</b>				
SP19460	2019/8 142	<b>Devialet</b>	Free Devialet Player	Complete teardown analysis including printed circuit board (PCB) cross-sections, PCB antenna X-rays and main integrated circuit (IC) die photos.
SP19460	2019/8 142	<b>Freebox</b>	Freebox Delta Server	Detailed BOM, the manufacturing cost of the server, optical module and security module and estimation of final manufacturer price
SP19446	2019/9 85	<b>Various</b>	Particle Sensor	Technical & cost analysis of 7 particle sensors, it includes block diagrams.
<b>CONSUMER</b>				
SP19496	2019/10 438	<b>Various</b>	e-Bikes Computer Display	Analyses of four e-bike computer displays. Comparison report included with technical choices made by manufacturers at the PCB, electronic component and hardware levels.
SP19463	2019/6 3990	<b>Magic Leap One</b>	Augmented Reality Headset	Complete bill of material, identification of components and assembly processes, featuring PCB technologies and PCB cross-section pictures.
<b>AUTOMOTIVE</b>				
SP20501	2019/1 67	<b>Aptiv</b> 4N0907217A	Lane Assist Front Camera for Audi A8	Complete teardown analysis of the Audi A8 Front Camera, including BOM and the manufacturing cost of the camera
SP19514	2019/12 110	<b>Nvidia</b> Tegra K1	Visual Computing Module	Complete analysis of the module, featuring deep IC and Memories die analyses, packaging processes and cross-sections
SP19510	2019/12 89	<b>Aptiv</b> R3TR	76GHz Short Range Radar	Complete teardown analysis with BOM and the manufacturing cost of the radar sensor

# SYSTEM

Ref.	Date Pages	Manufacturer Product	Type of Product	Overview
SP19508	2019/12 72	<b>Mando</b> MRR20	77GHz Mid-Range Radar	Complete teardown analysis with BOM and the manufacturing cost of the radar sensor
SP19502	2019/12 87	<b>Aptiv</b> Zfas	Audi A8 zFAS ADAS Platform	Complete teardown analysis with BOM and the manufacturing cost of the control unit
SP19500	2019/12 76	<b>Denso</b> DNSRR004	Short Range Radar	Complete teardown analysis with BOM and the manufacturing cost of the radar sensor
SP19499	2019/12 94	<b>Denso</b> DNMWR009	Cruise Control Radar Distance Sensor	BOM and manufacturing cost of the radar sensor. It also so includes a physical analysis of the MCU, a complete cost analysis and selling price estimation
SP19498	2019/11 77	<b>Bose</b>	Automotive Audio Amplifier	Complete teardown analysis of Bose Audio Amplifier from the Renault Talisman. Complete physical analysis and manufacturing cost estimate for every part. Frames
SP19497	2019/10 187	<b>LG</b>	Display Medianav in the Dacia Duster	Complete analysis of the dismantling of the LG Electronics screen and associated touch screen, taken from the latest Dacia Duster model.
SP19487	2019/9 172	<b>Volkswagen</b> MIB2	Discover Media Unit	Complete teardown analysis along with BOM and cost analysis.
SP19477	2019/9 100	<b>Ford</b> SYNC3	Display ECU	Complete teardown analysis along with BOM and cost analysis.
SP19476	2019/9 69	<b>Ford</b> SYNC 3	Silverbox	Complete teardown analysis along with BOM and cost analysis.
SP19461	2019/5 150	<b>LG</b>	Cluster and Infotainment Display module	Complete teardown analysis of LG's display and the associated touchscreen extracted from the A-Class Mercedes.
SP19457	2019/5 130	<b>ZF</b> S-Cam 4	Automotive Safety Mono and Tri Camera	Complete BOM and description of the electronics and housing assembling. A specific report describes the camera's manufacturing and packaging processes.
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.

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