

STATUS OF POWER IC: TECHNOLOGY, INDUSTRY AND TRENDS 2021

Market & Technology Report - December 2021

Power IC industrial players boost capacity, growing the market to \$25.6B by 2026.

WHAT'S NEW

- Power IC market update
- The impact of COVID-19, supply chain business models, and chip shortages on the market
- Power IC wafer market forecast by wafer size and substrate from 2020 to 2026.
- Major power IC supplier profiles
- Focus on enlarging manufacturing capacity for 200 and 300mm wafers
- Focus on China's growing competence in power IC device manufacturing and the country's efforts toward made-in-China power electronics.
- Trends toward device and system integration

KEY FEATURES

- Forecast for power semiconductor devices by package type from 2020 to 2026
- Power IC wafer market forecast by wafer size and substrate from 2020 to 2026.
- Update of power IC market forecast by application, from 2020 to 2026
- Update of power IC market forecast by power IC type, from 2020 to 2026
- COVID-19 impact and chip shortages
- Major power IC supplier profiles
- Focus on enlarging manufacturing capacity for 200 and 300mm wafers
- Market trends for each power IC application
- Main power IC companies' revenues in 2020
- Power electronics player rankings and landscape analysis for 2020
- Global power IC industry overview, with a focus on China
- Analysis of the latest M&A activity
- Overview of technology status and trends for power ICs

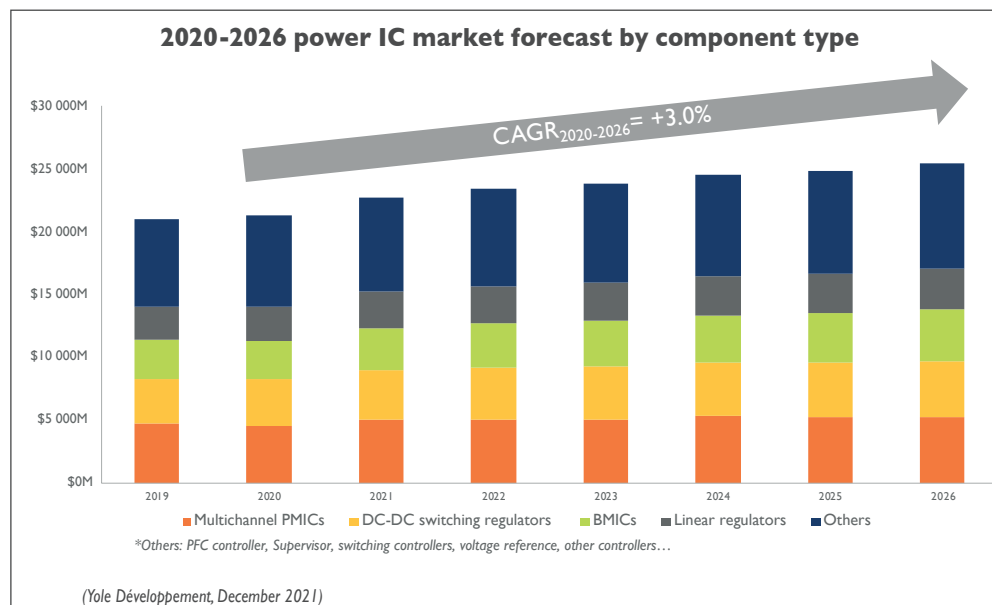
WHAT IS DRIVING THE \$25.6B POWER IC MARKET?

The total power integrated circuit (IC) market is expected to be worth more than \$25B by 2026, with a Compound Annual Growth Rate (CAGR) of 3.0% during the forecasted period. This is because power IC devices are used in almost all electric and electronic systems, with different requirements for each application.

The power IC market for mobile and consumer devices is the largest one, worth about \$11B in 2020. It is mainly driven by high-volume demand from smartphones, although the growth of this market will flatten in the forecasted period. Multichannel Power Management Integrated Circuits (PMICs) dominate the mobile and consumer product markets, where they power several loads with different rail voltages. Players such as Apple, Qualcomm, Intel, and Samsung S.LSI are very strong in this market.

The automotive segment is the most promising for the power IC market in terms of forecasted volumes. This is driven by electrification and autonomous driving, leading to a 9% CAGR₂₀₂₀₋₂₀₂₆ for this segment. Electric Vehicles (EVs) are expected to represent almost 30% of the market by 2026 and Battery Management Integrated Circuits (BMICs) are needed to manage the power flow through the EV battery. Yole also estimates that 80% of all passenger and light commercial vehicles will be equipped at least with a level I Advanced Driver Assistance System (ADAS) by 2026. Power IC players such as Texas Instruments, Analog Devices and STMicroelectronics are very aggressive in this market.

As shown in the report, Power ICs have good opportunities in other segments such as industrial, telecom and medical applications.



MANUFACTURING CAPABILITY AND SUPPLY CHAIN ORGANISATION

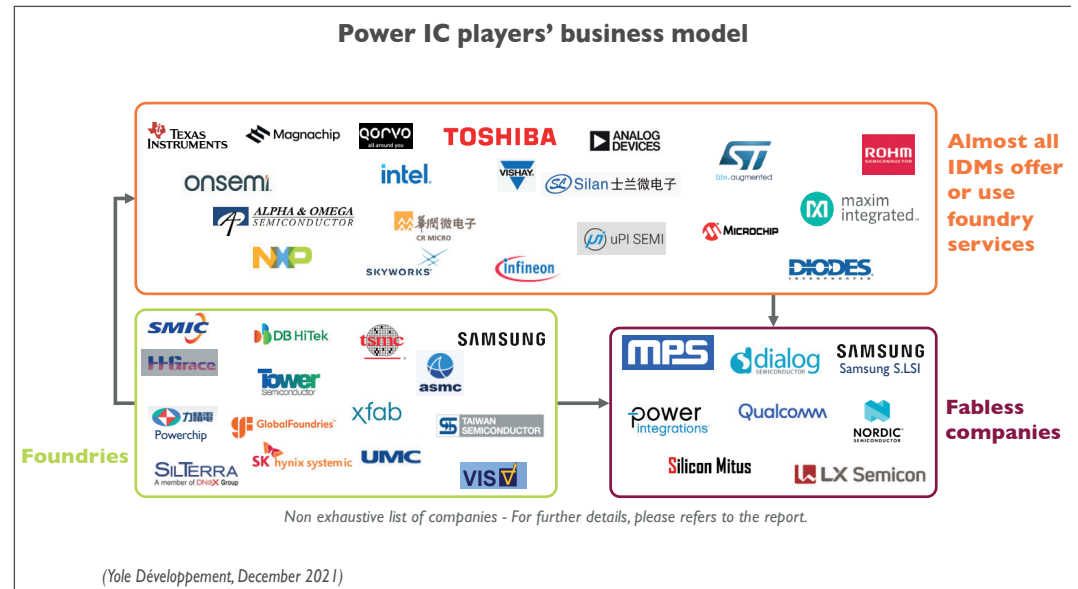
Due to COVID-19 and chip shortages, semiconductor players are increasing manufacturing capacity to secure their supply chain and to reduce manufacturing costs to remain competitive. The main Integrated Device Manufacturers (IDMs) and foundries, such as Infineon or Texas Instruments, are investing in 300mm wafer fabs. There are three main business models in the power IC landscape: IDM, foundry and fabless. IDMs, such as Texas

Instruments and Analog Devices manufacture their power IC devices internally. However, these players outsource some of their products to foundries. Foundries are normally specialized in making standard products. Companies such as TSMC, Tower Semiconductor, SMC, and Samsung Electronics operate with this business model. Finally, fabless companies do not possess their own manufacturing fabs. Among them Qualcomm is the leader in multichannel PMIC market.

The Chinese power IC market is by far the biggest. However, local Chinese power IC players' market share in their own country was only 12% in 2020. The Chinese power IC market is led by international players such as Texas Instruments and Analog Devices, but local players are progressively gaining market share. Chinese system level players are increasingly technologically accepted and are looking for local and strong supply chains, pushed

by the COVID-19 crisis' supply chain disruption and followed by semiconductor shortages. European Union and the USA administrations are also pushing for local semiconductor manufacturing to reduce their dependency on Asian manufacturers.

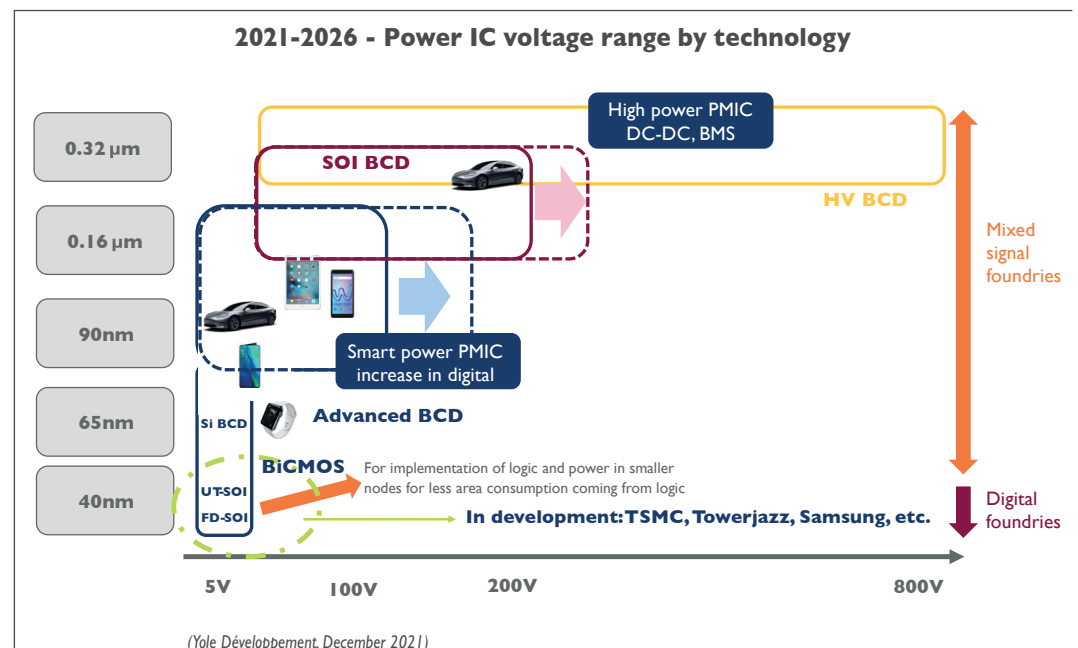
This report covers the main companies' investments in new fabs and the diversification of product portfolios, the key mergers and acquisitions and the detailed market shares.



WHAT ARE THE KEY TECHNOLOGICAL TRENDS IN THE POWER IC MARKET?

When we ask power management manufacturers about technology trends for power ICs, the first answer is usually "not much is happening, this is a highly cost driven market". But of course, this depends on the application and power IC product type. There are some end systems with space constraints, like consumer products and IoT that push for device or system integration. Device integration is driven by the need to integrate

different functions in the same chip. One example is the memory integration with the power IC, which has reduced lithography nodes to 90nm feature sizes. However, companies like Samsung and TSMC are looking to decrease this further, to 65nm. Of course, the node choice is not fixed and depends on the size of the memory part versus the power IC part of the chip. Another example is the increasing development of more specific power



ICs. For example, multichannel PMICs integrate several independent functions in the same chip, to satisfy the demand from automotive, computing, and automated systems. Power IC players also consider system integration in consumer applications such as smartphones, tablets, or wireless earbuds. Players like Analog

Devices are pushing for integrated passives in the system, leading to system in package components.

This report includes these different technology trends together with chip isolation trends, cost and performance trade-offs and packaging trends.

REPORT OBJECTIVES

- Provide an overview of the entire power IC market.
- Analyze the main drivers for power IC market by application.
- Provide market metrics and forecasts for power IC devices.
- Provide the overview of the power IC supply chain, with the main players and their market shares with a focus on the major players, with an additional focus on the Chinese power IC market.
- Analyze how business models and supply-chains evolve.
- Present main technological trends of power IC market.
- Provide the main development axes for power IC market.

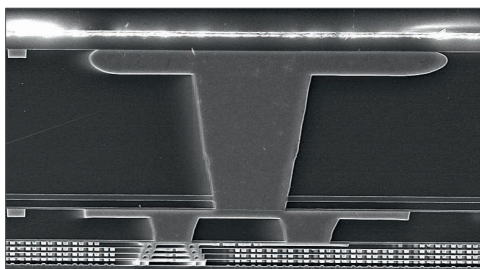
COMPANIES CITED IN THE REPORT (non exhaustive list)

Alpha and Omega Semiconductor, Analog Devices, Apple, Dialog Semiconductor, Diodes Incorporated, Global foundry, HHGrace, Infineon Technologies, Intel, Linear Technology, Lite-On Semiconductor, Magnachip, Maxim Integrated, MediaTek, Microchip, Microsemi, Monolithic Power Systems, NXP, Onsemi, Panasonic Corporation, Power Integrations, Qualcomm, Renesas Electronics Corporation, Ricoh, ROHM Semiconductor, Samsung, Sanken Electric Company, Semtech, Shindengen, SMC, STMicroelectronics, Texas Instruments, Toshiba, Tower Semiconductor, TSMC, Xfab and more.

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RELATED REPORTS, MONITORS & TEARDOWN TRACKS



- Status of the Power Electronics Industry 2021
- BCD Technology and Cost Comparison 2021
- Smartphones PMIC Comparison 2021



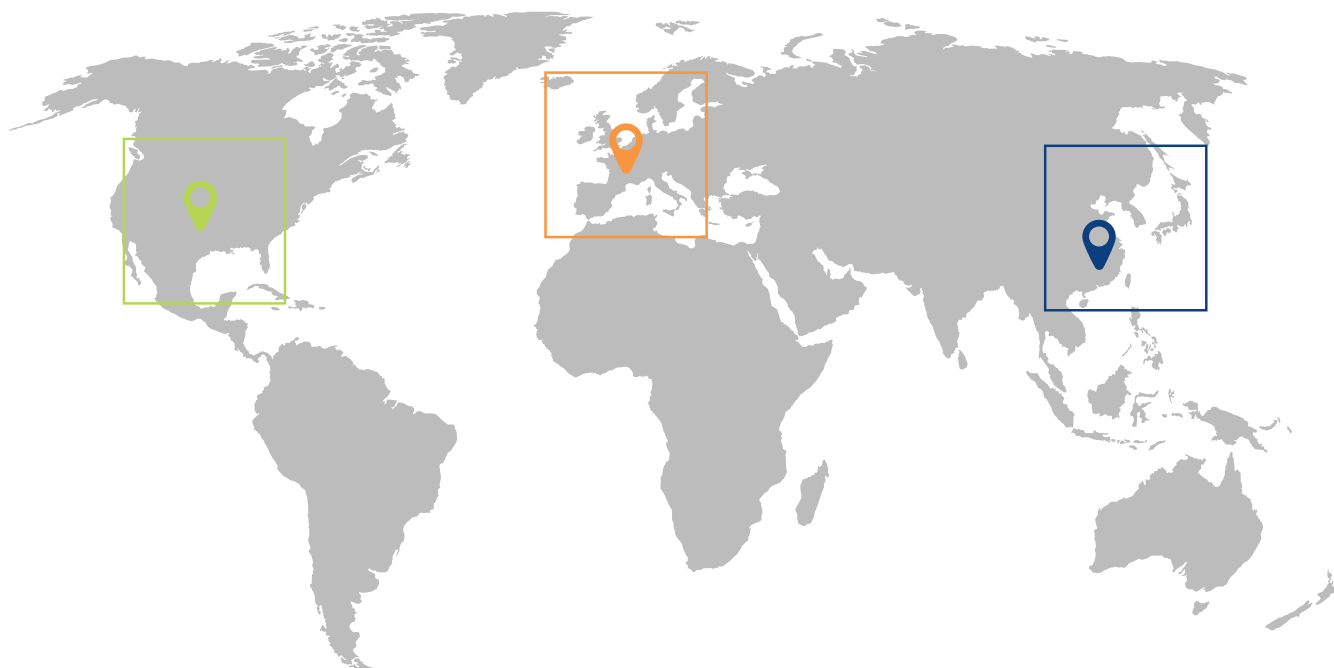
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 - Within a few days from the Seller’s confirmation of the order for Products already released and paid; or
 - Within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.
- 2.2 The Seller shall by no means be responsible for any delay pursuant to Article 2.1 above, in particular in cases where a new event or access to new contradictory information would require the Seller analyst to dedicate extra time to compute or compare the data in order to enable the Seller to deliver a high quality Product.
- 2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in Article 3 above.

- 2.4 The mailing is operated through electronic means either by email via the sales department or automatically online via an email/password. The Buyer is responsible for ensuring that the Buyers platform has the required capacities and authorisations to receive the Product(s) emailed by the Seller. If the Product’s electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that the Seller is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

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HSBC, 1 place de la Bourse 69002 Lyon France
Bank code: 30056
Branch code: 00170
Account n°: 0170 200 1565 87
BIC or SWIFT code: CCFRFRPP
IBAN: FR76 3005 6001 7001 7020 0156 587

- To secure the payments due to the Seller, the Seller reserves the right to request down payments from the Buyer. In such case, the need for a down payment will be mentioned on the corresponding order.

- 3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except as otherwise specifically agreed in writing by the Buyer and the Seller. If the Buyer fails to pay at the due date and fails to request and obtain from the Seller a payment extension, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the “BCE” + 7 points, in accordance with article L.441-6 of the French Commercial Code.

- 3.4 The Seller publications (reports, monitors, tracks...) are due for delivery only after receipt by the Seller of any payment due by the Buyer prior to delivery.

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- 4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for the choice of the Products purchased as well as for the use and interpretations the Buyer makes of the documents it purchases, of the results the Buyer obtains, and of the advice and acts the Buyer bases thereon.

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- 6.7 It is further acknowledged and agreed by the Buyer that any investor in the Buyer Company, any external consultant of the Buyer Company or any joint venture done with a third party in which the Buyer Company is involved, is not entitled to use a Product, without paying to the Seller the full price for a license to the required Product.

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