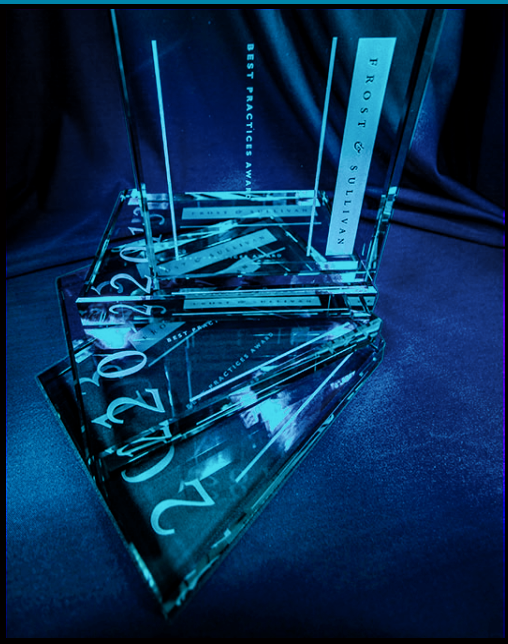


F R O S T & S U L L I V A N



## 2016 North American Automotive PLDs for ADAS Product Leadership Award



F R O S T & S U L L I V A N

**BEST**  
*2016* **PRACTICES**  
**AWARD**

**NORTH AMERICAN  
AUTOMOTIVE PLDS FOR ADAS  
PRODUCT LEADERSHIP AWARD**

*2016*  
**BEST PRACTICES**  
AWARDS

## Contents

Background and Company Performance .....	2
<i>Industry Challenges</i> .....	2
<i>Product Family Attributes and Business Impact</i> .....	2
<i>Conclusion</i> .....	4
Significance of Product Leadership.....	6
Understanding Product Leadership.....	6
<i>Key Benchmarking Criteria</i> .....	7
Best Practice Award Analysis for Xilinx .....	7
<i>Decision Support Scorecard</i> .....	7
<i>Product Family Attributes</i> .....	8
<i>Business Impact</i> .....	8
<i>Decision Support Matrix</i> .....	9
The Intersection between 360-Degree Research and Best Practices Awards.....	10
<i>Research Methodology</i> .....	10
Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices .....	11
About Frost & Sullivan .....	12

## Background and Company Performance

### *Industry Challenges*

The current era of the automotive industry is marked by rapidly emerging innovations and significant transformations. At the heart of these changes is the vision of developing autonomous driving technology. Frost & Sullivan notes that the potential impacts and benefits of autonomous driving are prodigious, and the technology today is nascent, with two likely paths ahead: one disruptive and the other incremental.

The intelligence behind today's Advanced Driver Assistance Systems (ADAS) and autonomous driving applications is rooted in the processing units that control the systems, and the hardware used in most of these applications is of significantly small dimensions and packaged into tight spaces, leaving developers with very little area to process huge amounts of data. As such, these systems are heavily confined by packaging limitations, so the design of control modules must address this constraint. Moreover, improving the weight of control units is necessary and driving innovation in the development of multi-domain controllers designed to reduce system complexity and package weight. In addition, the development and overall vendor costs borne by these systems to the actual performance ratio often hinders the penetration of all major System on Chip (SoCs) types in the automotive market. Frost & Sullivan points out that another challenge is improving the processing capability of the programmable logic devices (PLDs), considering the fast-growing demands for programmability and intelligence in software. This ever-growing need for improving the functionality of ADAS applications adds multiple layers of complexity to these systems.

Moreover, beyond these challenges, original equipment manufacturers (OEMs) report to Frost & Sullivan that they are uncertain about the technical direction that needs to be taken from a processing front. While field-programmable gate array (FPGAs) and PLDs both offer benefits and tradeoffs, today's technology roadmap revolving around LiDARs and camera systems indicate strong growth for the PLD market.

### *Product Family Attributes and Business Impact*

#### **Criterion 1: Match to Needs**

The complexity of ADAS applications has grown exponentially over the last half decade. Looking forward, this trend is likely to continue with OEMs aiming to commercialize level 2 and level 3 automated driving in the next 5 years. This complexity needs to be addressed across the ADAS value chain, from the sensor to the processor. The increasing design complexity, however, results in growing schedule risks that have a direct correlation to lowering the development costs with PLDs.

With Xilinx's Zynq UltraSCALE+ multiprocessor System-on-Chip (MPSoC), Frost & Sullivan feels that the company properly addresses this market need, particularly from its high level of scalability and modularity. The Zynq UltraSCALE+ MPSoC, through its integrated hardened ARM processor cores and flexible high bandwidth FPGA fabric, improved power

management system, and processing performance, provides industry-leading price/watt and price/performance ratings. The MPSoC can also integrate numerous ADAS applications and provide ASIL C/(D)-level functional capabilities.

## **Criterion 2: Reliability and Quality**

Digitization of multiple applications in today's vehicles has led to the integration of many systems. Intelligent and automated solutions in the vehicle can often demand high processing capabilities out of the SoCs which are also packaged in electronic modules that are prone to environmental stresses that can induce failures. As such, embedded application processors need to follow rigorous testing to measure hardware performance and stress tolerance. The AEC-Q100 stress test qualification requirement for electronic components used in automotive applications is the benchmark to assess automotive-grade quality and reliability.

With a full AEC-Q100 qualified XA product family of FPGAs and PLDs, Frost & Sullivan believes that Xilinx is best equipped to cater to these growing demands; the company provides its customers with the most reliable and scalable FPGAs and PLDs for ADAS as well as infotainment and driver information applications. From a reliability standpoint, the FPGAs and PLDs developed by Xilinx are far ahead of the baseline defined by AEC-Q100. For this reason, Xilinx has introduced its flagship Beyond AEC-Q100 testing, which started with the 90nm XA Spartan-3A family and since then has helped the company develop and supply robust XA products to its automotive clients (all of which surpass every AEC test parameter).

## **Criterion 3: Product/Service Value**

As one of the most cost-competitive industries, automotive Tier I suppliers and OEMs are constantly striving to improve the value of products and their utilization rates. The ADAS industry, specifically, is now breaking beyond the early adopter phase in its lifecycle; with increasing adoption, price sensitivity has increased as well, forcing suppliers to provide more processing capabilities at reduced offerings. Beyond the value proposition, clients are also looking to minimize defects and maintain the quality of their components that adhere to OEMs' growing ADAS needs.

By adhering to self-defined standards that exceed industry requirements and through continued innovation, Xilinx is able to navigate the competitive landscape and provide superior product value to its consumers. The company's unique functional safety architecture is also a key factor that makes Xilinx devices preferred for current and future ADAS modules among a number of global OEMs.

**Criterion 4: Customer Acquisition**

Innovative and state-of-the-art products will foster market success among a range of customers. The growing demand for ADAS applications from consumers has led to a huge market opportunity for SoC suppliers. Moreover, continued innovation for PLDs is possible only through economies of scale, which calls for growing a business both horizontally and vertically.

With more than a 60% global market share in automotive PLD applications (as confirmed through Frost & Sullivan independent analysis), Xilinx is currently ahead of its competitors. Its current success is hugely backed by unit shipments to North American clients as well as European and Japanese Tier One and OEM customers shipping into the North American market; but with the diverse product portfolio and superior functional safety offering, Xilinx is best positioned to improve its market share in North America beyond its current consumer base. Xilinx is also aggressively catering to widespread market requirements through its scalable, modular products that truly meet the requirements of premium and volume manufacturing clients.

**Criterion 5: Growth Potential**

The last two years have seen a large number of mergers and acquisitions in the Tier II SoC market leading to market consolidation. This activity has also resulted in pockets of opportunities for SoC suppliers to cater to this market void. Frost & Sullivan has forecast the ADAS market in North America to grow to nearly 9 billion dollars by 2020, and the growing automated driving market is likely to add to this huge market opportunity.

The Zynq UltraSCALE+ MPSoC is best positioned to cater to this growing market for multiple reasons. For instance, the processing system is capable of system control and application level processing, while the FPGA fabric on-board can also parallel process video inputs from multiple cameras and other sensors simultaneously. The MPSoC also has lock-step cores on the processor side, along with a Platform Management Unit and Security Management Unit each with separate triple redundant processor cores and voter logic designed to ensure a functionally safe and secure silicon system. Xilinx's strong multi-faceted automotive partner ecosystem which provides IP, design tools and services has helped the company position its offerings across a wide range of clients at extremely competitive prices. Xilinx PLDs are also better equipped, technically-speaking, than most of the competition today with respect to the performance-to-power ratio that is available in the market.

**Criterion 6: Human Capital**

Customers and innovation are at the core of Xilinx's values, and dedication to them resonates in every product developed by the company. Customer testimonies alone reflect the superiority of its products and services, and with a high rate of zero-defect shipments, Xilinx has indicated where its priorities lie and how committed it is to providing superior

customer satisfaction. With over 3,500 highly motivated employees working across multiple industries, Xilinx has ensured that the time and resources invested in human capital are well spent and in line with the company's beliefs and principles. Xilinx aims for success through harmony and has laid out detailed operations for employee satisfaction and improved CSR activities, alongside the growth of its core business.

### *Conclusion*

With strong technical capabilities and a successful track record in multiple sensor applications that include radar, LIDAR, and camera systems, Xilinx has been able to properly understand and address key challenges in today's automotive ADAS market for passenger cars. Considering that the ADAS market in North America alone is expected to grow four-fold in revenue by 2020 and increase opportunity for data stitching and sensor fusion, Xilinx PLDs are best equipped to cater to this growing demand. With its strong product portfolio aligned perfectly with the vision of automated driving, Frost & Sullivan firmly believes that Xilinx is capable of meeting the challenges posted by current and future ADAS applications and will be instrumental in enabling customers to achieve their future goals of automated driving.

These aforementioned achievements together make Xilinx the deserving recipient of the 2016 Frost & Sullivan Product Leadership Award.

## Significance of Product Leadership

Ultimately, growth in any organization depends upon customers purchasing from a company, and then making the decision to return time and again. A comprehensive product line, filled with high-quality, value-driven options, is the key to building an engaged customer base. To achieve and maintain product excellence, an organization must strive to be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.



## Understanding Product Leadership

Demand forecasting, branding, and differentiation all play a critical role in finding growth opportunities for a superior product line. This three-fold focus, however, must be complemented by an equally rigorous focus on pursuing those opportunities to a best-in-class standard. Customer communications, customer feedback, pricing, and competitor actions must all be managed and monitored for ongoing success. If an organization can successfully parlay product excellence into positive business impact, increased market share will inevitably follow over time.

## Key Benchmarking Criteria

For the Product Leadership Award, Frost & Sullivan analysts independently evaluated two key factors — Product Family Attributes and Business Impact — according to the criteria identified below.

### Product Family Attributes

- Criterion 1: Match to Needs
- Criterion 2: Reliability and Quality
- Criterion 3: Product/Service Value
- Criterion 4: Positioning
- Criterion 5: Design

### Business Impact

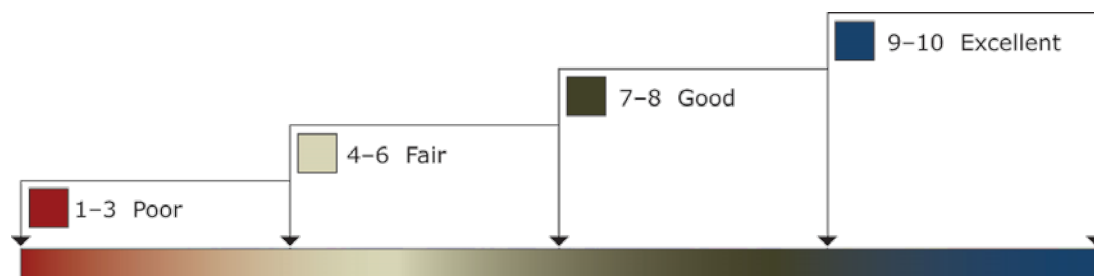
- Criterion 1: Financial Performance
- Criterion 2: Customer Acquisition
- Criterion 3: Operational Efficiency
- Criterion 4: Growth Potential
- Criterion 5: Human Capital

## Best Practice Award Analysis for Xilinx

### Decision Support Scorecard

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Scorecard. This tool allows our research and consulting teams to objectively analyze performance, according to the key benchmarking criteria listed in the previous section, and to assign ratings on that basis. The tool follows a 10-point scale that allows for nuances in performance evaluation; ratings guidelines are illustrated below.

#### RATINGS GUIDELINES



The Decision Support Scorecard is organized by Product Family Attributes and Business Impact (i.e., the overarching categories for all 10 benchmarking criteria; the definitions for each criteria are provided beneath the scorecard). The research team confirms the veracity of this weighted scorecard through sensitivity analysis, which confirms that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

The results of this analysis are shown below. To remain unbiased and to protect the interests of all organizations reviewed, we have chosen to refer to the other key players as Competitor 2 and Competitor 3.

#### DECISION SUPPORT SCORECARD FOR PRODUCT LEADERSHIP AWARD

<i>Measurement of 1–10 (1 = poor; 10 = excellent)</i>			
<b>Product Leadership</b>	Product Family Attributes	Business Impact	Average Rating
<b>Xilinx</b>	<b>9.5</b>	<b>9.5</b>	<b>9.5</b>
Competitor 2	7.0	8.0	7.5
Competitor 3	8.0	7.0	7.5

### *Product Family Attributes*

#### **Criterion 1: Match to Needs**

Requirement: Customer needs directly influence and inspire the design and positioning of the product family

#### **Criterion 2: Reliability and Quality**

Requirement: Products consistently meet or exceed customer expectations for performance and length of service

#### **Criterion 3: Product/Service Value**

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market

#### **Criterion 4: Positioning**

Requirement: Products or services unique, unmet need that competitors cannot easily replicate or replace

#### **Criterion 5: Design**

Requirement: The product features an innovative design, enhancing both visual appeal and ease of use

### *Business Impact*

#### **Criterion 1: Financial Performance**

Requirement: Strong overall financial performance in terms of revenues, revenue growth, operating margin and other key financial metrics

#### **Criterion 2: Customer Acquisition**

Requirement: Product strength enables acquisition of new customers, even as it enhances retention of current customers

#### **Criterion 3: Operational Efficiency**

Requirement: Staff is able to perform assigned tasks productively, quickly, and to a high quality standard

**Criterion 4: Growth Potential**

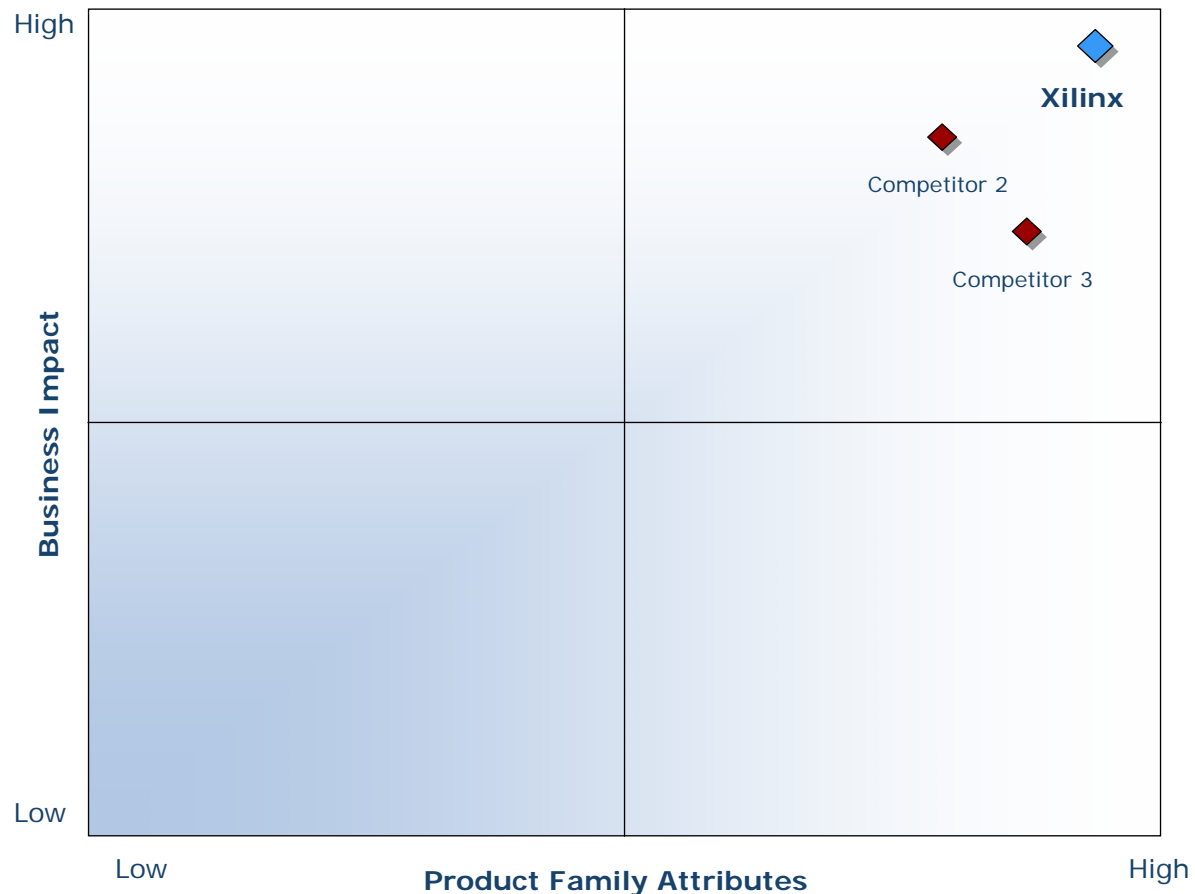
Requirements: Product quality strengthens brand, reinforces customer loyalty and enhances growth potential

**Criterion 5: Human Capital**

Requirement: Company culture is characterized by a strong commitment to product quality and customer impact, which in turn enhances employee morale and retention

***Decision Support Matrix***

Once all companies have been evaluated according to the Decision Support Scorecard, analysts can then position the candidates on the matrix shown below, enabling them to visualize which companies are truly breakthrough and which ones are not yet operating at best-in-class levels.

**DECISION SUPPORT MATRIX FOR PRODUCT LEADERSHIP AWARD**

## The Intersection between 360-Degree Research and Best Practices Awards

### *Research Methodology*

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often, companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry players and for identifying those performing at best-in-class levels.

### 360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



## Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 <b>Monitor, target, and screen</b>	Identify Award recipient candidates from around the globe	<ul style="list-style-type: none"> <li>• Conduct in-depth industry research</li> <li>• Identify emerging sectors</li> <li>• Scan multiple geographies</li> </ul>	Pipeline of candidates who potentially meet all best-practice criteria
2 <b>Perform 360-degree research</b>	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> <li>• Interview thought leaders and industry practitioners</li> <li>• Assess candidates' fit with best-practice criteria</li> <li>• Rank all candidates</li> </ul>	Matrix positioning all candidates' performance relative to one another
3 <b>Invite thought leadership in best practices</b>	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> <li>• Confirm best-practice criteria</li> <li>• Examine eligibility of all candidates</li> <li>• Identify any information gaps</li> </ul>	Detailed profiles of all ranked candidates
4 <b>Initiate research director review</b>	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> <li>• Brainstorm ranking options</li> <li>• Invite multiple perspectives on candidates' performance</li> <li>• Update candidate profiles</li> </ul>	Final prioritization of all eligible candidates and companion best-practice positioning paper
5 <b>Assemble panel of industry experts</b>	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> <li>• Share findings</li> <li>• Strengthen cases for candidate eligibility</li> <li>• Prioritize candidates</li> </ul>	Refined list of prioritized Award candidates
6 <b>Conduct global industry review</b>	Build consensus on Award candidates' eligibility	<ul style="list-style-type: none"> <li>• Hold global team meeting to review all candidates</li> <li>• Pressure-test fit with criteria</li> <li>• Confirm inclusion of all eligible candidates</li> </ul>	Final list of eligible Award candidates, representing success stories worldwide
7 <b>Perform quality check</b>	Develop official Award consideration materials	<ul style="list-style-type: none"> <li>• Perform final performance benchmarking activities</li> <li>• Write nominations</li> <li>• Perform quality review</li> </ul>	High-quality, accurate, and creative presentation of nominees' successes
8 <b>Reconnect with panel of industry experts</b>	Finalize the selection of the best-practice Award recipient	<ul style="list-style-type: none"> <li>• Review analysis with panel</li> <li>• Build consensus</li> <li>• Select winner</li> </ul>	Decision on which company performs best against all best-practice criteria
9 <b>Communicate recognition</b>	Inform Award recipient of Award recognition	<ul style="list-style-type: none"> <li>• Present Award to the CEO</li> <li>• Inspire the organization for continued success</li> <li>• Celebrate the recipient's performance</li> </ul>	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10 <b>Take strategic action</b>	Upon licensing, company may share Award news with stakeholders and customers	<ul style="list-style-type: none"> <li>• Coordinate media outreach</li> <li>• Design a marketing plan</li> <li>• Assess Award's role in future strategic planning</li> </ul>	Widespread awareness of recipient's Award status among investors, media personnel, and employees

## About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best in class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages almost 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from 31 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.