Honeywell

2015 Global Nanopower Series Magnetoresistive Sensor ICs New Product Innovation Award
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Background and Company Performance

Industry Challenges

The participants in the magnetoresistive (MR) sensors market face a number of challenges, primarily from a technological perspective. One of these challenges is the need to develop sensor modules that offer superior capabilities at low power levels during operation. To develop magnetoresistive (MR) sensors that function at micro and mili-volts, while concomitantly ensuring peak operational efficiency, requires a high level of technical expertise. Manufacturers are investing in further improvements in magnetic sensor technologies, attributed mainly to significant growth and demand. There have been developments in both technology and application areas where magnetic sensors have evolved in areas of sensitivity, size (compactness), packaging and flexibility. Through product innovation, companies need to dispel the belief that MR sensor systems are only suitable for high-power in critical applications.

To change this belief, MR sensor manufacturers are developing methods to address technical challenges, such as finding ways to replicate high-power solutions to very precisely align multiple magnetic sensor types and methods to assemble sub-systems while maintaining a small size. Moreover, companies, through product innovation, need to dispel the belief that low-power MR sensor systems do not have a future beyond reed switches. To change this belief, companies operating in this space are developing methods to address technical challenges, such as finding ways to replicate reed switch solutions.

Frost & Sullivan believes that companies who introduce new, advanced low power MR sensor solutions addressing the abovementioned market challenges would enjoy a strong competitive edge in the global MR sensors market. In the absence of a cost-effective solution, companies with abundant technological expertise that focus on designing unique, low-cost, low-power, high-precision solutions are poised to emerge as strong participants in the global market. Honeywell Sensing and Productivity Solutions has excelled in magnetic technology development by designing a range of nanopower series magnetoresistive (MR) sensor ICs that are ultra-sensitive and are designed to meet a multitude of diverse applications. This innovation, with large air gaps, small magnetic fields, and low power requirements, goes well beyond reed switches and it successfully addresses all of the technical challenges. This nanopower MR sensor platform series, known as SM351LT and SM353LT, offer two different versions to meet a variety of applications in multiple areas. The SM351LT and SM353LT platform of MR sensors has proven to be an efficient, highly responsive, miniaturized, flexible, durable and highly dependable cost-effective solution that exceeds all expectations.

New Product Attributes and Customer Impact

Innovative Element and Unique Solution
The unique value proposition behind Honeywell Sensing and Productivity Solutions' nanopower series magnetoresistive (MR) sensor ICs is that it is an enabling solution for consumer devices, commercial instruments, medical devices, and industrial products; the application possibilities are end-less. These nanopower series magnetoresistive (MR) sensor ICs operate at 10 times lower power than competing sensors available in the market today, yet they boast very high sensitivity, operating at 300 nano amps making them very unique.

The company has set a new standard in the global magnetic sensors market with the introduction of its new range of nanopower magnetoresistive sensor ICs as they work in unison with other components, boosting system-level performance to new heights. This innovative nanopower MR sensor not only replaces competing sensors, like Hall effect sensors and reed switches, it is ideal for newer deployments across number of vertical end user applications. It is multi-standard compliant and hence ensures seamless integration for multivendor device usage. This one, universal solution can be safely installed for monitoring and control, regardless of device and application. Honeywell Sensing and Productivity Solutions’ SM351LT and SM353LT nanopower MR sensors have proven performance in both normal and critical applications in highly precision-sensitive metering like electric, gas and water, consumer white goods, and security. In addition, the technology has penetrated mobile platforms, which has opened access to all devices that are diversifying or switching over to mobile connectivity and Internet of Things (IoT) and has opened the door for abundant opportunity for nanopower MR sensors in promising future multifold deployments, thereby ensuring exponential growth in its installed base. Users have been quite impressed with the SM351LT and SM353LT nanopower MR sensors’ superior functionality, which has resulted in immense demand.

In addition to the above, these nanopower MR sensors have a long lifespan and can operate efficiently for more than ten years with repeated use. Given all of the above benefits, Frost & Sullivan sees the SM351LT and SM353LT sensors capturing a significant part of the MR sensors share of the global magnetic sensors market in the near future.

**Leading Edge Sensors and Operating Flexibility**

Commonly, manufacturers use multiple technology platforms to design new products, especially with high-tech, highly sensitive products with superior operational efficiency. However, Honeywell Sensing and Productivity Solutions incorporated only one technology platform in its innovative SM351LT and SM353LT nanopower MR sensors. Although initially designed for use across a number of application areas to replace reed switches and Hall effect sensors on low power uses, both SM351LT and SM353LT MR sensor ICs use a very low average current consumption and a push-pull output that does not require a pull-up resistor. SM351LT and SM353LT MR sensor ICs can operate from a supply voltage as low as 1.65 V which is ultra-low, ensuring impressive power efficiency.
The SM351LT and SM353LT have been developed to lend flexibility for use of nanopower MR sensors, depending on operating environment. The first version, the SM351LT MR Sensor IC, has been developed for applications that require ultra-high magnetic sensitivity that ranges from a minimum of 7 G to a maximum of 11 G and a very low current draw of 360 nA. The second version, the SM353LT MR Sensor IC, has been developed for installations that require very high magnetic sensitivity with an operating range from a minimum 14 G to maximum of 20 G and a very low current draw of 310 nA. In order to facilitate ease of automated pick-and-place component installation, Honeywell Sensing and Productivity Solutions supplies these MR sensors in a specially developed subminiature SOT-23 tape-and-reel surface mount package with 3,000 units per reel. Honeywell Sensing and Productivity Solutions’ technological excellence is exhibited in customizing these MR sensors to the specific requirements of bulk users and certain key critical applications. These MR sensors are easy to use as they do not require the magnet polarity to be identified. Unlike its competing technology-based sensors, both the SM351LT and SM353LT MR sensor ICs respond to either the North or South Pole when applied in a direction parallel to the sensor.

**Competitive Excellence**

Nanopower solutions exhibit strong competitive excellence in their applications. This is the only nanopower MR sensor IC solution of its kind that can be used in any industry irrespective of the product type, plus it has built-in safety and security measures to maintain functional integrity. By leveraging its magnetic technology to develop an industry-leading solution that functions at extremely fast speeds with high precision (even in the most crucial applications) Honeywell Sensing and Productivity Solutions has successfully innovated ultra-sensitive MR sensor devices that are equipped to accommodate a wide range of diverse applications. Development of this ultra-sensitive nanopower MR sensor has opened endless opportunities to design new products and devices for medical, industrial, and consumer electronics as well as commercial applications.

Honeywell Sensing and Productivity Solutions’ new nanopower MR sensor IC line offers a number of different features and functionalities compared to reed switch and Hall effect solutions, which are limited and are offered by Honeywell Sensing and Productivity Solutions’ competitors in the market. Hall magnetic sensors dominate the market, yet magnetoresistive sensors (especially AMR) pose a challenge for these traditional devices, because magnetoresistive sensors continue to be used in a variety of applications where Hall magnetic sensors are also used. The global magnetic sensors market has a large number of established and emerging participants. The resulting increase in competition is leading to pricing pressures, as manufacturers are taking immense measures (such as resorting to price reduction) to penetrate markets, such as cellular phone applications, in consumer electronics where magnetic sensors need a compelling price point that is balanced with the right features for the electronics manufacturers to incorporate these.
sensors into their products.

Keeping in mind the required sensor attributes to meet user needs, Honeywell Sensing and Productivity Solutions employed solid state technology to innovate a compact, highly sensitive, small, durable, nanopower MR sensor IC that is superior to its competition. In fact, none of its competitors has been able to design and manufacture a similar nanopowered MR sensor IC. Using low-cost MR material, a small footprint, and plastic molded packaging has enabled Honeywell Sensing and Productivity Solutions to sell its MR sensors at very economical prices that are much lower than its competition. Such disruptive technology-based nanopower MR sensor ICs have enabled remote sensing device applications with minimal stress on the battery, thereby enhancing battery life considerably.

Other key benefits of Honeywell Sensing and Productivity Solutions' nanopower series magnetoresistive (MR) sensor IC technology include real-time monitoring, time savings, a long lifespan, high portability, reusability, low operating cost, zero fault potential, and high security with anti-tamper switches. Both the SM351LT and SM353LT MR sensor ICs are highly sensitive, yielding extremely accurate and reliable results to which none of the competitors’ MR sensors, reed switches or Hall sensors have been able to match.

**Increased ROI**

Honeywell Sensing and Productivity Solutions’ MR sensor ICs significantly lower customers’ costs for monitoring and control. This highly responsive, fail-safe technology eliminates errors even in repeatable monitoring processes, drastically reducing the cost of monitoring. Honeywell Sensing and Productivity Solutions’ solution offers automated pick-and-place component installation and considerable ease-of-use, eliminating the need to train technicians or to use expensive additional equipment, thus creating superior cost savings. The installation cost of both versions is negligible or almost nil, instead of the recurring investments through frequently needed replacements by competing solutions.

**Customer Penetration Potential**

Although Honeywell initially developed nanopower MR sensors to replace reed switches and Hall effect sensors, they proved to be highly flexible. Both SM351LT and SM353LT MR sensor ICs exhibited high acceptance in applications other than replacement in critical applications. They primarily targeted utility meters but the fact is they have proven their performance across vertical markets like industrial, building automation, and white goods. Both nanopower MR sensor ICs display high growth potential in other diverse application areas, including mobile platforms, medical devices, handheld patient care monitoring devices, infusion pumps, health and wellness equipment, industrial smoke detectors, consumer electronics, home automation and M2M, security, and a host of position-sensing applications.
Honeywell Sensing and Productivity Solutions continues to invest in research and development to improve its MR sensor ICs. Furthermore, the company’s constant focus on tracking emerging customer needs enables it to introduce industry-first products and solutions designed to offer unrivaled customer value and ROI. Such an approach has kept Honeywell Sensing and Productivity Solutions ahead of its competition in the global nano-power MR sensor IC market.

**Conclusion**

Honeywell Sensing and Productivity Solutions, through its best-in-class and innovative nanopower magnetoresistive range of sensor ICs, serves the best interests of its customers across a widespread market arena that includes the consumer electronics, home automation, mobile platform, M2M & IOT, research laboratories, and defense as well as medical-diagnostic devices. Ensuring user-friendly customer service along with improved, advanced, and affordable solutions delivery in line with market demands while offering customized solutions for more effective results has helped Honeywell Sensing and Productivity Solutions address key industry challenges in the magnetic sensors market. Its recently developed nanopower magnetoresistive sensor line is recognized as an enabling innovative solution that has met a long-unfulfilled industry need. This product demonstrates the company’s innovative excellence and has helped it emerge as the largest supplier of nanopower magnetoresistive sensor ICs. Because of its strong overall performance, Honeywell Sensing and Productivity Solutions is recognized with Frost & Sullivan’s 2015 New Product Innovation Award.
Significance of New Product Innovation
Ultimately, growth in any organization depends upon continually introducing new products to the market, and successfully commercializing those products. For these dual goals to occur, a company must be best-in-class in three key areas: understanding demand, nurturing the brand, differentiating from the competition. This three-fold approach to delivering New Product Innovation is explored further below.

Understanding New Product Innovation
Innovation is about finding a productive outlet for creativity—for consistently translating ideas into high quality products that have a profound impact on the customer.
Key Benchmarking Criteria

For the New Product Innovation Award, we evaluated two key factors—New Product Attributes and Customer Impact—according to the criteria identified below.

New Product Attributes
- Criterion 1: Match to Needs
- Criterion 2: Reliability
- Criterion 3: Quality
- Criterion 4: Positioning
- Criterion 5: Design

Customer Impact
- Criterion 1: Price/Performance Value
- Criterion 2: Customer Purchase Experience
- Criterion 3: Customer Ownership Experience
- Criterion 4: Customer Service Experience
- Criterion 5: Brand Equity

Best Practice Award Analysis for Honeywell Sensing & Productivity Solutions

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 New Product Attributes and Customer 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 in as Competitor 2 and Competitor 3.

<table>
<thead>
<tr>
<th>Measurement of 1–10 (1 = poor; 10 = excellent)</th>
<th>New Product Attributes</th>
<th>Customer Impact</th>
<th>Average Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Competitor 2</td>
<td>6.5</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>Competitor 3</td>
<td>6.0</td>
<td>6.4</td>
</tr>
</tbody>
</table>

**New Product Attributes**

**Criterion 1: Match to Needs**
Requirement: Customer needs directly influence and inspire the product’s design and positioning

**Criterion 2: Reliability**
Requirement: The product consistently meets or exceeds customer expectations for consistent performance during its entire life cycle

**Criterion 3: Quality**
Requirement: Product offers best-in-class quality, with a full complement of features and functionality

**Criterion 4: Positioning**
Requirement: The product serves a unique, unmet need that competitors cannot easily replicate

**Criterion 5: Design**
Requirement: The product features an innovative design, enhancing both visual appeal and ease of use

**Customer Impact**

**Criterion 1: Price/Performance Value**
Requirement: Products or services offer the best value for the price, compared to similar offerings in the market

**Criterion 2: Customer Purchase Experience**
Requirement: Customers feel like they are buying the most optimal solution that addresses both their unique needs and their unique constraints

**Criterion 3: Customer Ownership Experience**
Requirement: Customers are proud to own the company’s product or service, and have a positive experience throughout the life of the product or service
**Criterion 4: Customer Service Experience**
Requirement: Customer service is accessible, fast, stress-free, and of high quality

**Criterion 5: Brand Equity**
Requirement: Customers have a positive view of the brand and exhibit high brand loyalty

**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.
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.
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 to best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

<table>
<thead>
<tr>
<th>STEP</th>
<th>OBJECTIVE</th>
<th>KEY ACTIVITIES</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Monitor, target, and screen</td>
<td>Identify award recipient candidates from around the globe</td>
<td>Conduct in-depth industry research, Identify emerging sectors, Scan multiple geographies</td>
<td>Pipeline of candidates who potentially meet all best-practice criteria</td>
</tr>
<tr>
<td>2 Perform 360-degree research</td>
<td>Perform comprehensive, 360-degree research on all candidates in the pipeline</td>
<td>Interview thought leaders and industry practitioners, Assess candidates’ fit with best-practice criteria, Rank all candidates</td>
<td>Matrix positioning all candidates’ performance relative to one another</td>
</tr>
<tr>
<td>3 Invite thought leadership in best practices</td>
<td>Perform in-depth examination of all candidates</td>
<td>Confirm best-practice criteria, Examine eligibility of all candidates, Identify any information gaps</td>
<td>Detailed profiles of all ranked candidates</td>
</tr>
<tr>
<td>4 Initiate research director review</td>
<td>Conduct an unbiased evaluation of all candidate profiles</td>
<td>Brainstorm ranking options, Invite multiple perspectives on candidates’ performance, Update candidate profiles</td>
<td>Final prioritization of all eligible candidates and companion best-practice positioning paper</td>
</tr>
<tr>
<td>5 Assemble panel of industry experts</td>
<td>Present findings to an expert panel of industry thought leaders</td>
<td>Share findings, Strengthen cases for candidate eligibility, Prioritize candidates</td>
<td>Refined list of prioritized award candidates</td>
</tr>
<tr>
<td>6 Conduct global industry review</td>
<td>Build consensus on award candidates’ eligibility</td>
<td>Hold global team meeting to review all candidates, Pressure-test fit with criteria, Confirm inclusion of all eligible candidates</td>
<td>Final list of eligible award candidates, representing success stories worldwide</td>
</tr>
<tr>
<td>7 Perform quality check</td>
<td>Develop official award consideration materials</td>
<td>Perform final performance benchmarking activities, Write nominations, Perform quality review</td>
<td>High-quality, accurate, and creative presentation of nominees’ successes</td>
</tr>
<tr>
<td>8 Reconnect with panel of industry experts</td>
<td>Finalize the selection of the best-practice award recipient</td>
<td>Review analysis with panel, Build consensus, Select winner</td>
<td>Decision on which company performs best against all best-practice criteria</td>
</tr>
<tr>
<td>9 Communicate recognition</td>
<td>Inform award recipient of award recognition</td>
<td>Present award to the CEO, Inspire the organization for continued success, Celebrate the recipient’s performance</td>
<td>Announcement of award and plan for how recipient can use the award to enhance the brand</td>
</tr>
<tr>
<td>10 Take strategic action</td>
<td>The award recipient may license the award for use in external communication and outreach to stakeholders and customers</td>
<td>Coordinate media outreach, Design a marketing plan, Assess award’s role in future strategic planning</td>
<td>Widespread awareness of recipient’s award status among investors, media personnel, and employees</td>
</tr>
</tbody>
</table>
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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 over 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.