Booth sessions

Melexis analyst day 2018

BMW Brand Store - Boulevard de Waterloo 23, 24 Waterloolaan - 1000 Brussels
CURRENT SENSORS PRODUCT PORTFOLIO

Bruno Boury
Product Line Manager
BU: Sense & Drive
PL: Current Sensors

CURRENT SENSORS PRODUCT PORTFOLIO

- 2nd Generation on the market (being) designed in at nearly all OEMs
- Proprietary IMC-Hall® technology brings advantages for designers
- New product range Plug&Power™ unlocking new markets (OBC, HV-DCDC...)
- Market leading sensor accuracy (thermal & lifetime)

- Industry electric motor control (automation) and automotive traction motor control have very similar requirements → single product development amortization
- Solar market is volatile, but under permanent growth in the green energy mix

2018
- MLX91216/17 pushing the thermal stability limits further

2016
- MLX91210 opens new Plug&Power™ portfolio

2015
- MLX91208 Very High Field for traction Inverters

2014
- MLX91208 High Speed Portfolio (Low & High Field)

2013
- MLX91209 introducing patented lifetime stability

2012
- MLX91206/07 programmable ASSP for Inverter

2011
- MLX91206/07 programmable ASSP for Battery/DCDC

2007
- ASICs for industry & automotive

2005
- MLX91205 IMC-Hall® technology for industrial applications

Fit for adjacent markets

- Industry electric motor control (automation) and automotive traction motor control have very similar requirements → single product development amortization
- Solar market is volatile, but under permanent growth in the green energy mix
- Plug & Power portfolio is ultimate integration for ISG

Broad Hall effect sensor portfolio

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- Solar market is volatile, but under permanent growth in the green energy mix
- Plug & Power portfolio is ultimate integration for ISG

Conclusion

1. Incumbent position at renowned TIER2 & TIER1
2. Conventional Hall & proprietary IMC-Hall® for battery and inverter applications, as well as DCDC converters. Extensive portfolio – factory programmable sensors
3. Plug&Power™ new portfolio addressing new applications (module power monitoring, OBC, HV DCDC converters)
**Interior/Exterior LED Lighting Controller ICs**

**Target applications**
- Automotive RGB ambient lighting
- Animated RGB ambient lighting
- Surface integrated lighting
- Automotive exterior lighting

**Key benefits**
- Fully integrated system solution with very limited external components
- Small footprint through high integration factor
- Full color control by end user through high programmability
- Lowest system cost of market available solutions

**Conclusion**
1. Full programmability through integrated Flash based microcontroller
2. Strong focus on user experience usable for all types of vehicles (including electric)
3. Broad fit for automotive interior and exterior lighting applications for all OEMs
4. Integrated system solutions to overcome LIN-bus limitations

**Broad and growing product portfolio**
- Melexis is #1 worldwide for RGB ambient light controller ICs
- Successful re-use of system on chip integration since Gen 1
- Easy development of new family members
- Leading integration by using best in class SOI technology

**Target applications**
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Nick Czarnecki
Product Line Manager
BU: Sense & Drive
PL: Magnetic Position Sensors

MAGNETIC POSITION SENSORS PRODUCT PORTFOLIO

- Unique packaging options (PCB, PCB-less) enable meeting customer size, shape and weight requirements from large trucks to small personal transports
- Functional safety (ASIL) capability enables integration into safety-conscious applications like autonomous vehicles
- Creation of stray field robust magnetic allows for growing together with the increasing number of electrified vehicles
- Low power versions allow for battery operation enabling internet connected, always-on sensing
- Flexible nature (3D sensing) removes design constraints in placement of the magnet and sensor

Fit for adjacent markets

- High speed SPI angular sensor
- First linear hall with magnet temp compensation
- First 3D linear and joystick magnetic position sensor
- First 3D linear hall
- First programmable linear hall with EEPROM
- Second Gen inductive ASIC
- First ASIL-C magnetic angle sensor
- Stray field robust angular sensor
- 500 Millionth Triaxis Sensor Sold
- Triaxis magnetic node for consumer
- Linear hall with functional safety and multipoint temperature calibration
- 100 Millionth Triaxis Sensor Sold
- PCB-less package launched
- 100 Millionth Linear Hall Sensor Sold
- First linear hall with magnet temp compensation
- High speed SPI angular sensor
- First inductive ASIC
- SENT 2007 support integrated
- First rotary magnetic position sensor
- First programmable linear hall

1. Best in class performance angle sensors for nearly every current and future automotive position sensing application
2. Wide portfolio enabling angle position sensing with a variety of packaging options, output types, and safety levels for both automotive and adjacent markets
3. Focused on the future to support electrification, autonomous driving, and adjacent market trends and requirements

Fit for adjacent markets

- Low power versions allow for battery operation enabling internet connected, always-on sensing
- Flexible nature (3D sensing) removes design constraints in placement of the magnet and sensor

Broad position sensor portfolio

- Unique packaging options (PCB, PCB-less) enable meeting customer size, shape and weight requirements from large trucks to small personal transports
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Conclusion
EMBEDDED MOTOR DRIVER ICs PORTFOLIO

Unique areas of expertise
- Enable motor drive with lowest heating and lowest acoustic noise
- Enable low cost, small size mechatronics with digital interface
- Sensor & Drive concept, integration of motor driver and sensors
- World-class hw+sw solution support by our application engineers

Broad motor driver IC portfolio
- Smart embedded drivers for 1W...1KW
- Supporting all motor types: BLDC, DC, Steppers
- ECU communication via LIN / PWM interface
- Melexis IP for silent sensorless motor drive

Conclusion
1. Enabling smart & small, plug & play mechatronics
2. Excellent IC portfolio match for the next generation of electrical and hybrid cars
3. World class technology: smallest single die, high temperature Flash memory, robust LIN cell, reliable motor sensing
**PRESSURE SENSORS SOLUTIONS PRODUCT PORTFOLIO**

- Absolute Pressure
- Relative Pressure
- Mid Pressure
- Sensor Interfaces ASSPs

**Conclusion**

1. Full solutions including MEMS, sensor interface, package & calibration
2. Strong focus on harsh media automotive requirements
3. Unmatched performance and robustness

**Fit for adjacent markets**

- Primary focus on automotive powertrain for ICEs and hybrid vehicles
- Same devices can be used for in-cabin comfort applications
- Same devices can be used for white good applications

**Broad pressure sensor portfolio**
**Conclusion**

1. World class performance & innovation since 2000
2. Strong focus on adjacent markets with broad application portfolio
3. Cost efficient thermography and miniaturization enable new applications and markets

**Single pixel temperature sensing**
- Digital & factory calibrated, easy to use
- Broad temperature range & medical grade
- Miniaturization & SMD: high performance & small size

**Thermal array portfolio**
- Unique price vs. resolution vs. performance point
- People detection, counting and location for smart building
- Safety applications (overheating prevention)
TIME-OF-FLIGHT SENSORS PRODUCT PORTFOLIO

- Gen 3 VGA & QVGA single chip ToF
- Gen 2 QVGA ToF chipset
- Gen 1 QVGA ToF chipset
- Gen 1 QVGA ToF sensor

QVGA: 320 x 240 px                  VGA: 640 x 480 px

Conclusion
1. Leadership in automotive-grade Time-of-Flight sensors
2. Widest product portfolio, with QVGA and VGA resolution
3. Designed for automotive. Applied to in-cabin sensing, exterior sensing, robot vision and more.

Broad TOF sensor portfolio
- Gen2 as cost-effective QVGA solution
- Gen3 with VGA resolution for wide field-of-view sensing, comfort & safety
- Focus on automotive

Fit for adjacent markets
- Same IC designed for automotive, applicable also for adjacent markets (robot navigation, security, ...)

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LATCH & SWITCH PRODUCT PORTFOLIO

- Successful re-use of platform & generation concepts since 1993
  - 2 billion sensors in the field
  - High rate of new product launches thanks to platform concept
  - Clear USPs (low power) ensuring growth and enabling customized ASSPs

Conclusion

1. World class performance and broad application coverage since 1993
2. Strong focus on electrification, safety & product customization
3. Broad market fit, technologies designed for automotive, easily re-valued in adjacent markets (white goods, 2-wheelers)
<table>
<thead>
<tr>
<th>Poster</th>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>Current</td>
<td>CMOS</td>
<td>Complementary Metal-Oxide Semiconductor</td>
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<td></td>
<td>TIER1</td>
<td>A tier one company is the most important member of a supply chain, supplying components directly to the original equipment manufacturer (OEM) that set up the chain.</td>
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<tr>
<td></td>
<td>IMC</td>
<td>Integrated Magneto Concentrator</td>
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<td></td>
<td>OBC</td>
<td>On Board Charger</td>
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<td>HV</td>
<td>High Voltage</td>
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<td>ADAS</td>
<td>Advanced Driver Assistance Systems</td>
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<td></td>
<td>DCDC</td>
<td>Direct Current to Direct Current</td>
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<td></td>
<td>EV</td>
<td>Electric vehicle</td>
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<td></td>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<td>Opto</td>
<td>TOF</td>
<td>Time-of-Flight</td>
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<td></td>
<td>VGA</td>
<td>Video Graphics Array</td>
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<td></td>
<td>QVGA</td>
<td>Quarter Video Graphics Array</td>
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<td></td>
<td>IC</td>
<td>Integrated Circuit</td>
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<td></td>
<td>LIN</td>
<td>Local Interconnect Network</td>
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<td>LIN RGB</td>
<td>RGB</td>
<td>Red, Green and Blue</td>
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<td></td>
<td>SOI</td>
<td>Silicon On Insulator</td>
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<td>Embedded motors</td>
<td>B-EMF</td>
<td>Back Electromotive Force</td>
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<td></td>
<td>UVW</td>
<td>3 terminal pins of BLDC motor</td>
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<td></td>
<td>BLDC</td>
<td>Brushless DC</td>
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<td></td>
<td>DC</td>
<td>Direct Current</td>
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<td></td>
<td>ECU</td>
<td>Engine Control Unit</td>
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<td></td>
<td>PWM</td>
<td>Pulse Width Modulation</td>
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<td></td>
<td>IP</td>
<td>Intellectual Property</td>
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<td></td>
<td>AFS</td>
<td>Adaptive Front-Lighting System</td>
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<tr>
<td></td>
<td>HVAC</td>
<td>Heating, Ventilation, and Air Conditioning</td>
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<td>HW</td>
<td>Hardware</td>
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<td></td>
<td>SW</td>
<td>Software</td>
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<tr>
<td>L&amp;S</td>
<td>TSOT</td>
<td>Thin Small Outline Transistor</td>
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<tr>
<td></td>
<td>EEPROM</td>
<td>Electrically Erasable Programmable Read Only Memory</td>
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<tr>
<td></td>
<td>ASIL</td>
<td>Automotive Safety Integrity Level defined in ISO 26262 standard</td>
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<td></td>
<td>PCB</td>
<td>Printed Circuit Board</td>
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<td>Temperature</td>
<td>SMD</td>
<td>Surface Mount Device</td>
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<td>RF</td>
<td>Radio Frequency</td>
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<td>Pressure</td>
<td>MEMS</td>
<td>Micro-Electro-Mechanical Systems</td>
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<tr>
<td></td>
<td>ASSP</td>
<td>Application Specific Standard Product</td>
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<td></td>
<td>ICE</td>
<td>Internal Combustion Engine</td>
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<td>Position</td>
<td>SENT</td>
<td>Single Edge Nibble Transmission</td>
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<td></td>
<td>SPI</td>
<td>Serial Peripheral Interface. A communications protocol for use between two integrated circuits</td>
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<td></td>
<td>I2C</td>
<td>Inter-Integrated Circuit. A communications protocol for use between two integrated circuits</td>
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<td></td>
<td>DMP-4</td>
<td>Dual Mold Package, 4 pins</td>
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<td></td>
<td>PRONL</td>
<td>Park, Reverse, Neutral, Drive, Low (automatic transmission positions)</td>
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<tr>
<td></td>
<td>ETRS</td>
<td>Electronic Transmission Range Selection</td>
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<td></td>
<td>EMC</td>
<td>Electromagnetic Compatibility</td>
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<td></td>
<td>G</td>
<td>Gauss, Unit of magnetic field</td>
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<td>mT</td>
<td>millitesla, Unit of magnetic field</td>
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