XENSIV™ – coreless magnetic current sensors entering high power
A miniature sensor family for applications up to 120 A

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Sensor+Test 2019, Nuremberg
# Agenda

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Application overview – Industry

- Industry inverter
- PV Inverter
- Robots
- Drives
- BMS/smart circuit breaker
- Smart metering
- Power Tools
- Charging
TLI4971 – Application example
Current sensor for in-phase measurement

Block diagram motor drive

Current sensor requirement

- Enabling motor control for smooth operation
- Protection of output stages against overcurrent events
- Accurate in-phase measurement in harsh environment
- Galvanic isolated measurement for high voltage applications
High Power Current Sensing
Key Performance Parameters

Integration
Accuracy
- Linearity
- Offset

Total Cost
Bandwidth

Galvanic Isolation
Strayfield Robustness

Power Dissipation
Inductance

Protection and Safety
## Agenda

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Magnetic Sensing can be done by various basic principles

**Core-less**

- Hall probes
- Conductor

**Core-based**

- Field concentrator
- Compensation winding
- Field probe

**Advantages**

- Stray field suppression through differential voltage measurement of 2 Hall probes/cell
- No saturation, no hysteresis, high linearity
- Low dependency on temperature and lifetime
- Sensor comes in small SMD packages

*Infineon's choice for next generation current sensor*
Agenda

1. Target Applications
2. Magnetic Current Sensing – Principles
3. Coreless Implementation: TLI4971
4. Summary
Light & small package for coreless sensor
TISON-8: 8x8x1mm

Top view
with mold compound

Bottom view
current rail & signal pins
TLI4971 designed for – low power loss and cross talk robustness

Current path thru the package

220 μΩ resistance soldered on PCB

Hockey-Stick design allows a maximum on sensitivity by minimal power loss!

Rpath = 220 μOhms
0,55 W @ 50 Arms
Light & small package for HV isolation
TISON-8: 8x8x1mm

- Top view with mold compound
- Differential Hall-plates
- Bottom view current rail & signal pins

High Voltage 1150 V
Insulation plate
Clearance 4mm
Low Voltage

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TLI4971 Feature set overview

- Analog output
- 120 kHz Bandwidth
- Differential measurement with high sensitive hall cells
- Temperature & stress compensation
- Overcurrent outputs
- Integrated EEPROM
- Reference voltage
- Diagnosis Mode
- Ultra-Low Resistance SMD Package
Split of control and protection function
Optimization of signal paths

Control functions
- Analog signal
- High accuracy
- Low noise
- Constant group delay

Protection functions
- Digital signal
- Minimized delay
- Programmable Ith
- Diverse signal path

Fast Overcurrent detection: Delay time <1.5 µs

Control functions secured through output bandwidth up to 120 kHz

Extensive test features for device and signal path integrity
Superior Accuracy over temperature and lifetime

Distribution of max. total error

Lifetime drift

Initial error, Full Temperature range

Initial error, 25°C

Temperature & lifetime stability
delta=1.25%

0h error:
Temperature & lifetime stability
delta=1.25%

Residual Error of 1.25% after single point calibration
Thermal evaluation (Ta=25°C, still air)
TLI4971 (TISON-8) vs competitor (SOIC16)

› TISON-8 power package enables high current capability
  - Low current path resistance
  - Improved thermal design

› Even larger difference with heatsink
# Tools and collaterals

### Collaterals and Documentations
- Data Sheet
- Programmer Guides
- Solder recommendation
- User & Programming Guide
- AppNotes (EMC, Design Guidelines ...)

### Hardware and Tools
- Spice Model
- Generic Programmer
- Three Phase reference PCB
- PCB Design Data

### Planned
- Productive Programmer
### Agenda

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Summary

The TISON-8 package enables standard SMD assembly and provides:
- Integrated Isolation up to 1.1 kV VIORM
- A full scale range of up to 120 A
- Lowest-in-class path and thermal resistance for minimized power losses

TLI4971 is a first member of Infineon's 2nd generation magnetic current sensor family.

Compared to core-based sensors, coreless sensors provide significant benefits in terms of:
- Accuracy and Linearity
- Assembly complexity and
- Constructed space

The TISON-8 package enables standard SMD assembly and provides:
- Integrated Isolation up to 1.1 kV VIORM
- A full scale range of up to 120 A
- Lowest-in-class path and thermal resistance for minimized power losses

Thanks to separate output pins for control and protection, the device supports protection of advanced IGBT technologies while providing a high quality analog output signal for control.
Part of your life. Part of tomorrow.