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

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## Agenda

1. **Target Applications**
2. Magnetic Current Sensing – Principles
3. Coreless Implementation: TLI4971
4. Summary
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

- Accuracy
  - Linearity
  - Offset
- Total Cost
- Bandwidth
- Galvanic Isolation
- Strayfield Robustness
- Power Dissipation Inductance
- Protection and Safety
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Magnetic Sensing can be done by various basic principles

**Core-less**
- Hall probes
- Conductor

**Core-based**
- Field concentrator
- Field probe
- Compensation winding

**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
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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!

$R_{path} = 220 \, \mu\text{Ohms}$

0.55 W @ 50 Arms
Light & small package for HV isolation
TISON-8: 8x8x1mm
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

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

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

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=25C, 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
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Summary

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

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

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.