

# SWOBODA CURRENT SENSOR MODULE FOR INFINEON HYBRIDPACK™ DRIVE G2 POWER MODULES



*The Swoboda CSM510HP2S/D is compatible with all Infineon HybridPACK™ Drive G2 power modules.*

## INTRODUCTION

Current sensors are used in a wide variety of commercial, industrial and automotive applications. They help to optimize the power consumption of electrical appliances connected.

The Swoboda Current Sensor Module CSM510HP2x is a galvanically isolated ultra-compact current sensor that can measure high currents at high voltages. The sensor is fully automotive qualified and fits seamlessly into the Infineon HybridPACK™ Drive G2 power modules for inverter applications.

## FEATURES & BENEFITS

- Available in single-ended (CSM510HP2S) and differential (CSM510HP2D) output configurations
- Embedded Infineon XENSIV™ TLE4973 chipset including direct pass-through of all input/output signals
- Measurements of peak currents of  $\pm 1600$  A and above
- Single supply voltage of 5 V
- ASIL-B (SEooC)
- Immunity to external / stray magnetic fields due to differential measurement principle
- High bandwidth / fast response time
- Dedicated over current detection output with a detection time of less than 1.7  $\mu$ s
- Built-in programming interface (via dedicated pin) for EOL calibration
- Automotive qualified
- Compatible with HybridPACK™ Drive G2 power modules of Infineon Technologies AG
- Available in EloPin (pressfit) configuration, also suitable for soldering

## ADVANTAGES

- High accuracy measurement of both alternating and direct currents (AC/DC)
- Significantly smaller footprint and lower weight than conventional core-based current sensors
- Extremely low drift over temperature and lifetime
- High linearity due to coreless measurement principle
- Bandwidth of more than 120 kHz

## APPLICATION AREAS

- Automotive main inverter
- Battery management / protection
- Electric motor drives
- General current monitoring

Any questions about this product?

Please contact us:

Sales Department

Swoboda Schorndorf KG

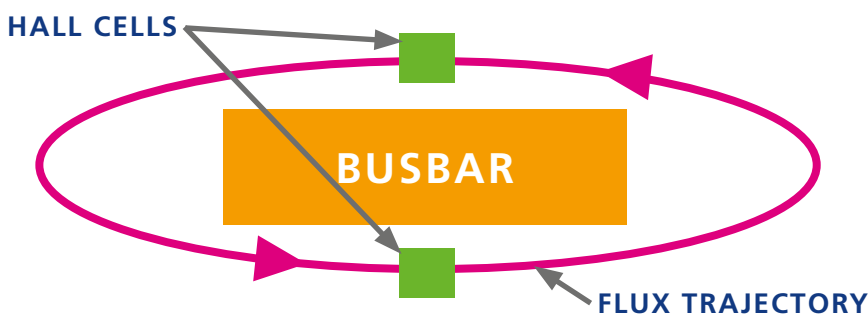
Telephone: **+49 (0) 7181 7003-0**

► [sales.schorndorf@swoboda.com](mailto:sales.schorndorf@swoboda.com)

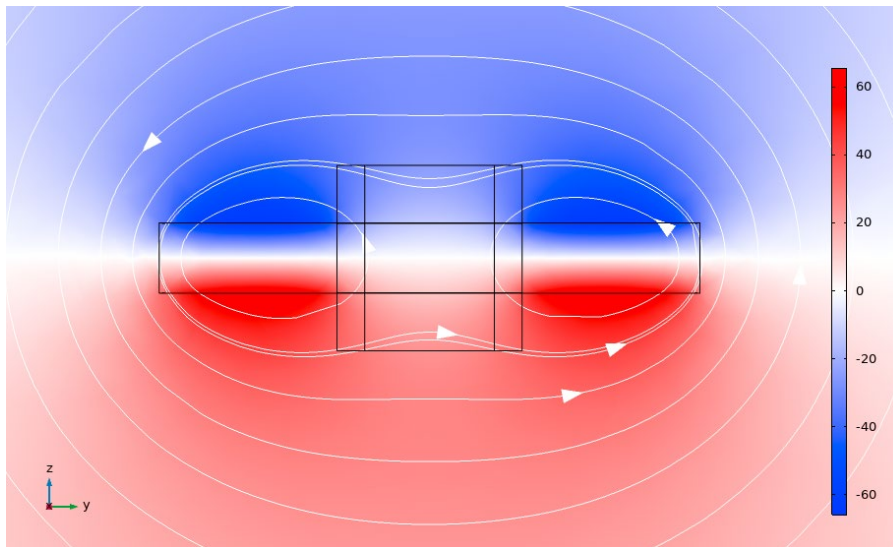
## PRINCIPLE OF OPERATION

All current carrying conductors generate a magnetic field around them. Therefore, by measuring this flux density, the current flowing can be measured. The current sensor module for Infineon HybridPACK™ Drive G2 power modules contains of two hall cells separated by a gap of approximately 2.3 mm, as shown below. The difference between the flux densities measured by the two sensitive elements is filtered and amplified. Subsequently, an analog output voltage that is proportional to the measured flux density is given out. As this flux density is proportional to the current flowing, the chip measures the current flowing in the bus bar. This system by inherent design offers the following advantages over traditional core based single ended sensors:

- Inherent Immunity to uniform stray magnetic flux densities because of the differential measurement principle.
- High linearity and negligible hysteresis due to the absence of a ferromagnetic core.



Hall cells in differential configuration, marked in green, along with the busbar.



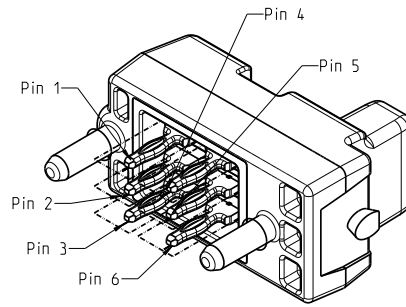
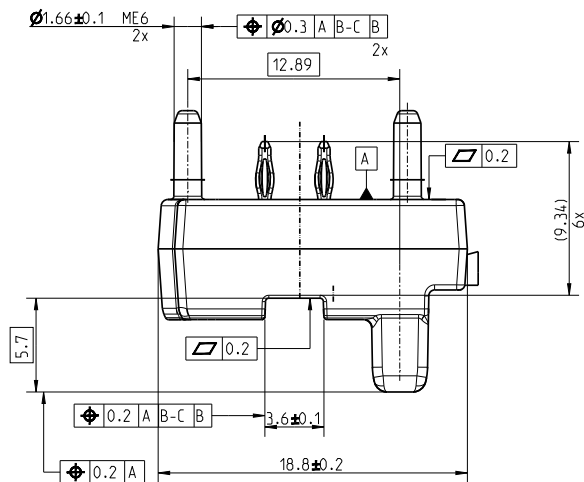
Flux lines based on finite element analysis.

## AVAILABLE PRODUCTS

PRODUCT TYPE	SUPPLY VOLTAGE	IC USED	SHORT DESCRIPTION
CSM510HP2S	5.0 V	Infineon XENSIV™ <a href="#">TLE4973-RE35S5-S0010</a>	5.0 volt current sensor with single ended analog output
CSM510HP2D*	5.0 V	Infineon XENSIV™ <a href="#">TLE4973-RE35S5-S0001</a>	5.0 volt current sensor with differential analog output

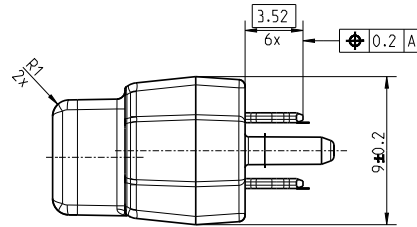
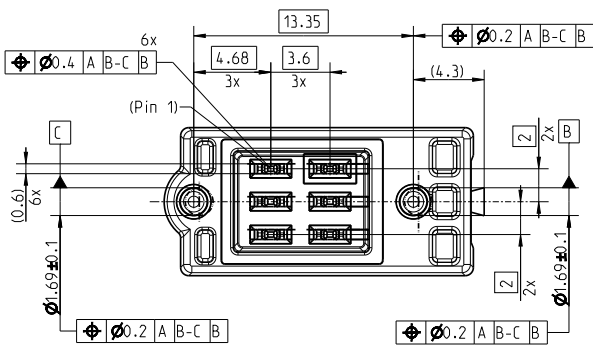
\*pre-configured for semi-differential output

**DRAWING**



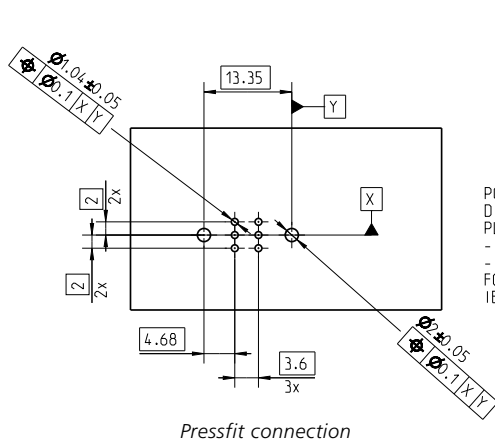
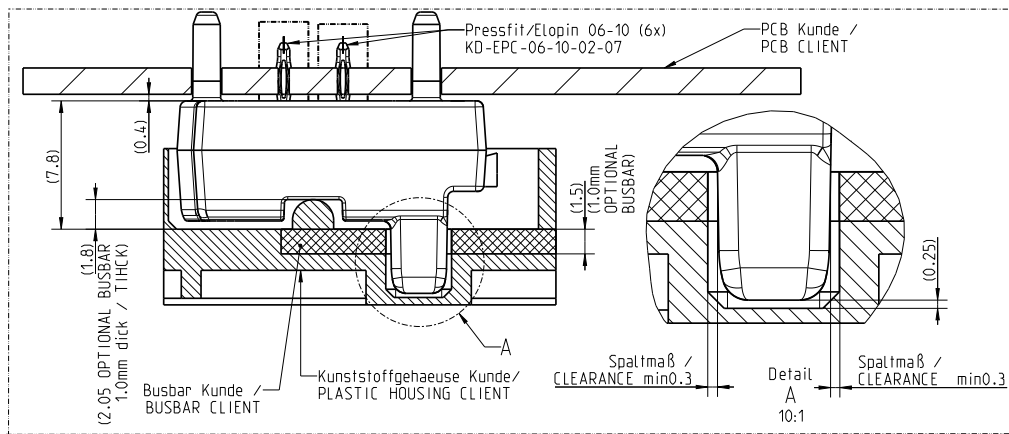
Pinbelegung PINOUT	
1	Vdd
2	Aout
3	DCDI
4	GND
5	Vref
6	OCD

PARTNAME	MATERIAL	PLATING
PLASTICS	Epoxidur	
PREMOLD	PPA GF-30	
PINS	CuNi3SiMg	Sn100 matte over Ni ductile

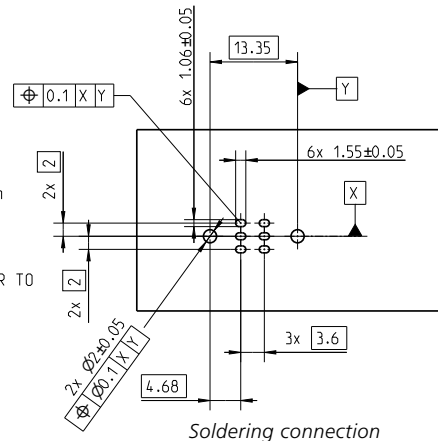


Nur zur Information / FOR INFORMATION ONLY

Schnittstellendefinition / INTERFACE DEFINITION



Pressfit connection



Soldering connection

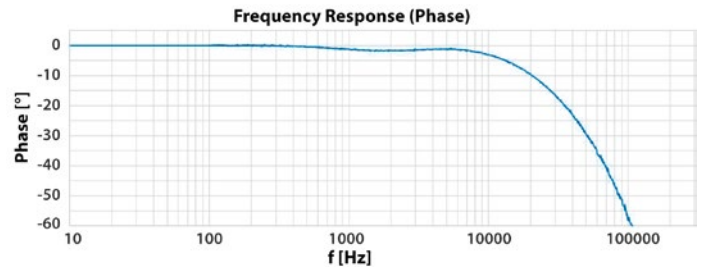
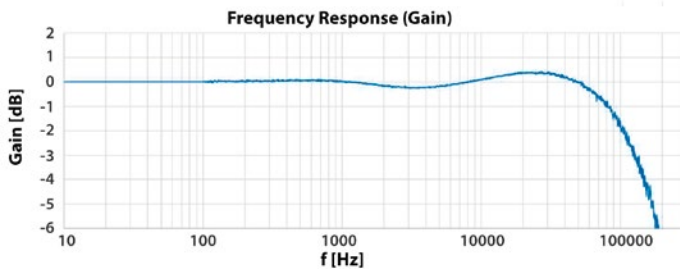
PCB THICKNESS MIN. 1.0mm  
DIAMETER OF FINISHED  
PLATED THROUGH HOLE  
- Cu THICKNESS > 25µm  
- Sn THICKNESS = 1-2µm  
FOR PADS DIMENSION REFER TO  
IEC 60352-5 STANDARD

Swoboda reserves the right to apply changes to its products without prior notice.

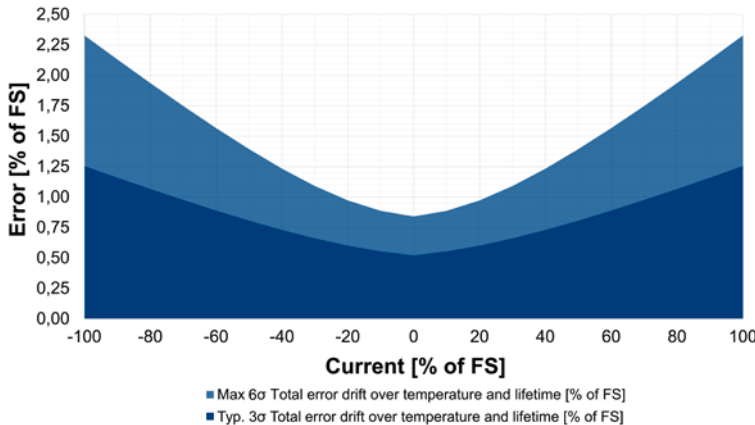
**NOMINAL OPERATING CHARACTERISTICS**

SIGNAL DESCRIPTION	UNITS	MIN.	NOM.	MAX.	REMARKS
Primary current, peak value	[A]	-1600	-	+1600	Range selectable
Ambient temperature	[°C]	-40	-	150	
V <sub>DD</sub>	[V]	4.5	5.0	5.5	Supply voltage
A <sub>OUT</sub>	[V]	-0.3	-	V <sub>DD</sub>	Analog signal output
		-	-	-	Not used, should be kept open in single ended mode (CSM510HP2S)
V <sub>REF</sub>	[V]	-0.3	-	V <sub>DD</sub>	Inverted analog signal output in differential mode (CSM510HP2D)
OCD	[V]	-0.3	-	V <sub>DD</sub>	Overcurrent detection output: open drain out
DCDI	[V]	-0.3	-	V <sub>DD</sub>	DCDI communication interface: open drain I/O
I <sub>DD</sub>	[mA]	-	17.5	21	Current consumption, I <sub>Aout</sub> = 0 mA (CSM510HP2S)
		-	21	25	Current consumption, I <sub>Aout</sub> = 0 mA (CSM510HP2D)
Load current	[mA]	-6.5	-	6.5	DC current
Output capacitance	[nF]	6	6.8	8	
Step response time	[µs]			1.7	
Bandwidth	[kHz]	120			-3 dB, C <sub>Aout</sub> = 6.8 nF
Phase shift	[°]		60.5		@ 120 kHz
External magnetic field suppression	[dB]	34	40		When a 4 kHz, 20 mT homogenous external magnetic field is applied.
Working Range	-	-	S3	-	Default setup in TLE4973 EEROM, user customizable via DCDI communication interface
Weight	[g]	-	3	-	

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Measured frequency plots of the current sensor combined with a HybridPACK™ Drive G2 power module.



Estimated 3σ & 6σ error of the sensor after calibration on busbar, for a measurement range of ±1000 A. For calibration and programming information, please refer to Infineon XENSIV™ TLE4973-RE3555-X datasheet.