SENSITEC
MagnetoResistive Sensors

CDK4000

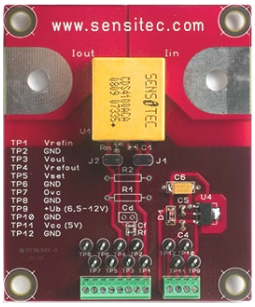
MagnetoResistive Current Sensor Demoboard

Data sheet and application notes

The CDK4000 Demoboard offers the opportunity to experience the features and benefits of the CDS4000 current sensors in a quick and simple manner.

The primary current to be measured can be directly connected via screwed connections to a busbar or a cable connector. On the secondary side all signal pins of the CDS4000 sensor are lead through to screw-type terminals and additional test pins.

Two jumpers can be used to switch between internal and external references and also between current and voltage output. All contacts necessary for the adjustment of the overcurrent detection are provided. An integrated voltage regulator offers the additional possibility to operate the board using a 5 V to 12 V supply.



CDK4000

Electrical data

This document is to be used in combination with the data sheet of the appropriate CDS4000 current sensor. Please check it for more detailed information. The latest data sheet is available on the internet at www.sensitec.com.

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	4.75	5	5.25	V
$+U_b$	Supply voltage (regulator input)	7	-	12	V
T_{amb}	Ambient temperature	-25	-	+85	°C
T_{stg}	Storage temperature	-25	-	+85	°C

Absolute maximum ratings

In accordance with the absolute maximum rating system (IEC60134).

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-0.3	+7	V
$+U_b$	Supply voltage (regulator)	-0.3	+12	V
T_{amb}	Ambient temperature	-25	+85	°C
T_B	Busbar temperature	-25	+100	°C

Stresses beyond those listed under “Absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Handling instructions

- The CDK4000 Demoboard is exclusive designed for evaluating and analyzing the functions of CDS4000 current sensors and only for utilization under laboratory conditions.
- Ensure a good thermal connection of primary current conductor. This has a direct influence on the heat generation in the PCB and thereby the operating life of the Demoboard.
- The Demoboard is designed for all CDS4000 sensor types in the range up to 150 A nominal current. Please take care not to exceed the permissible peak current of the appropriate sensor type!

Features

- Single 5 V power supply
- Integrated voltage regulator up to 12 V power supply
- Reference voltage input / output
- Adjustable overcurrent detection
- Integrated filter for frequency response adaptation

Advantages

- Very simple handling by usual connection terminals
- Space allocated for components needed for overcurrent detection
- Easy switching between current and voltage output signal

Applications

- Test and evaluation of CDS4000 current sensors under laboratory conditions

CDK4000.DSE.03

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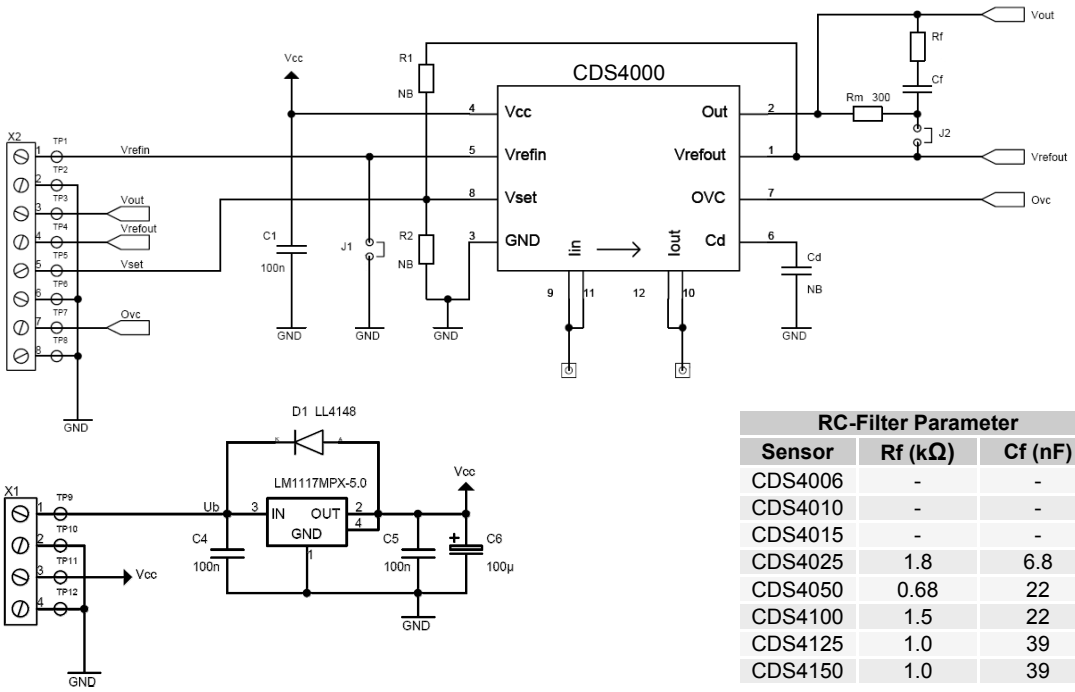
Wiring diagram



RC-Filter Parameter		
Sensor	**Rf (kΩ)**	**Cf (nF)**
CDS4006	-	-
CDS4010	-	-
CDS4015	-	-
CDS4025	1.8	6.8
CDS4050	0.68	22
CDS4100	1.5	22
CDS4125	1.0	39
CDS4150	1.0	39

Fig.1: Wiring diagram of the CDK4000 Demoboard.

Power supplies
The Demoboard provide two terminals for the power supply. On TP9 and TP10 the equipped voltage regulator can be supplied by 7 to 12 V to ensure a “clean” supply of 5 V for the sensor.
Use TP11 and TP12 for direct supply with 5 V (± 5% is permissible) for testing the influence of voltage swing on the current sensors output. The sensor is simply buffered by a 100 nF capacitor C1.

Initial operation
In the factory default condition the jumper J1 and J2 (see Fig.1) should be placed for proper operation of the Demoboard. In this case the sensor works with the internal reference voltage and delivers a voltage output signal over the 300 Ω load resistor Rm provided. In addition the RC-filter corrects the frequency response. In this configuration the differential sensor signal on Rm is available on TP3 and TP4. For a single-ended A/D-conversion the connections of TP2 and TP3 (GND and V_{out}) are recommended.

Scaled output signal (J2)
Jumper J2 selects the kind of output signal and enables usage of the RC-filter.
If the jumper is placed, the sensor output is engaged to the load resistor Rm and the frequency response correction is active.
By removing the jumper, the sensor delivers a current output signal which reduces electromagnetic susceptibility and thus enables the use of longer signal lines. The RC-filter is deactivated in that case.
Furthermore with an arbitrary load resistor the output voltage can be optimally adapted to increase the resolution.

External Reference (J1)
Jumper J1 serves to choose an internal or external reference voltage. With the jumper in place, the internal reference of 2.5 V (±0.01 V) is used and is also available at TP4. Other reference levels can be set with the reference voltage input on TP1 with a voltage of 1.5 V up to 2.6 V. Besides, make sure to remove the jumper J1 to protect your voltage source from possible damage. **Note:** For a missing voltage on Vrefin the reference voltage output Vrefout is undefined and could deliver 0.8 V.

Overcurrent detection (OVC)
The CDS4000 current sensors offer with OVC a digital comparator output to report primary current overloads. The OVC output on TP7 is pulled low when a user defined critical current value is exceeded. The overcurrent detection is adjustable for both threshold voltage and delay time. The overcurrent threshold is set by applying a voltage to pin 8 (V_{set}) according to the formula:

$$V_{set} = V_{refout} - I_{OC} \cdot R_M \cdot G_I$$

The potential divider with R1 and R2 is used to adjust the threshold for the overcurrent detection. In consideration of internal 60 kΩ in parallel to R1 the divider calculates as follows:

$$\frac{V_{set}}{V_{refout}} = \frac{R_2}{\frac{R_1 \cdot 60\ k\Omega}{R_1 + 60\ k\Omega} + R_2}$$

with 1.0 kΩ < (R_1 + R_2) < 7.5 kΩ
and R_1 or R_2 < 1.0 kΩ.

To avoid an unnecessary reaction of the overcurrent detection in the event of short spikes or other transient effects at the primary busbar, that should not be signalled, the delay time can be adjusted via the capacitor Cd:

$$t_d \approx 0.5\ \mu s \frac{C_d\ (pF)}{50\ pF}\ \mu s \quad or$$

$$C_d \approx 50\ pF \cdot (\ t_d\ (\mu s) - 0.5\ \mu s\ ).$$

Pinning

Pin	Symbol	Parameter
1	V_{refin}	External reference voltage input
2	GND	Ground
3	V_{out}	Output voltage
4	V_{refout}	Reference voltage output
5	V_{set}	Threshold voltage for overcurrent detection
6	GND	Ground
7	OVC	Overcurrent detection output
8	GND	Ground
9	$+U_b$	Supply voltage (7…12 V)
10	GND	Ground
11	V_{CC}	Supply voltage (5 V)
12	GND	Ground
13	I_{in}	Primary current input
14	I_{out}	Primary current output

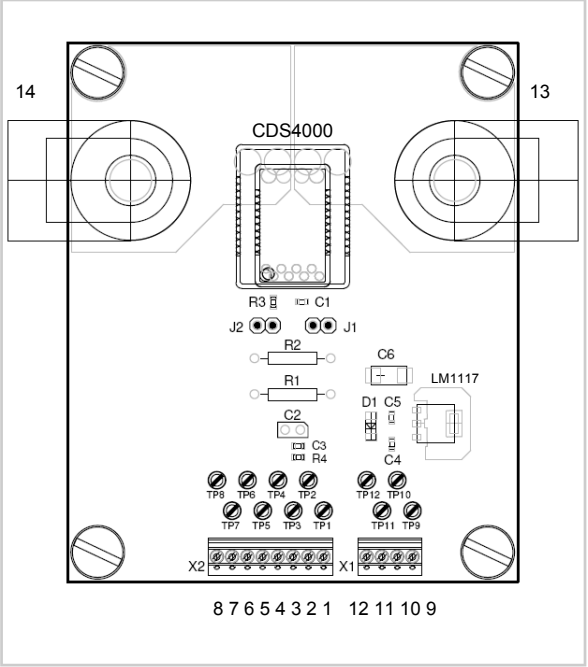


Fig.2: Connections of a CDK4000 Demoboard.

Dimensions

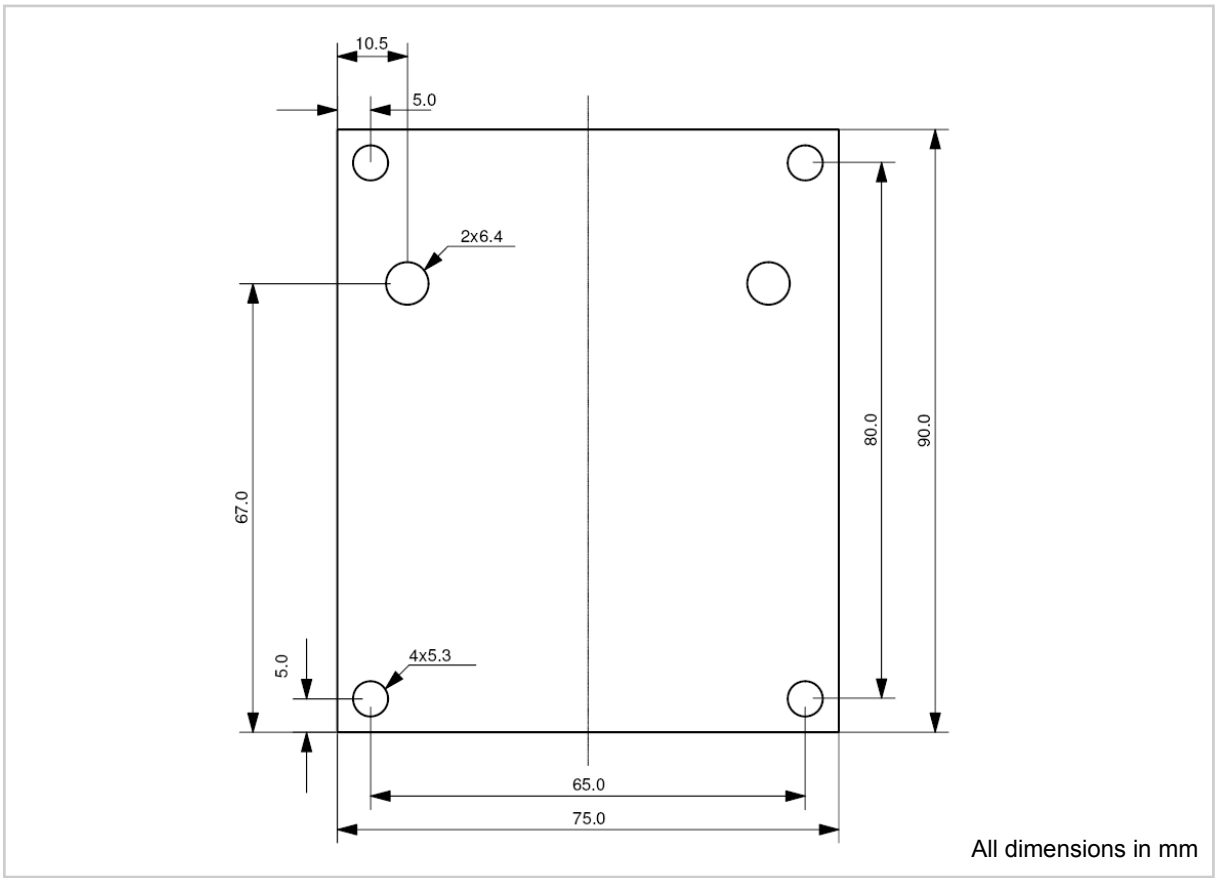


Fig.3: Outline of the CDK4000 Demoboard. Tolerance ± 0.2 mm unless otherwise specified.

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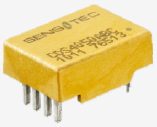
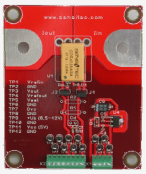
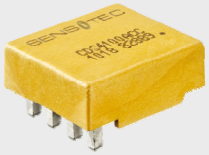
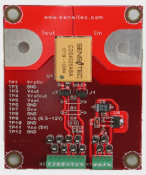
The CDS4000 product family

The CDS4000 product family offering PCB-mountable THT current sensors from 6 A up to 150 A nominal current for various industrial applications. For quickly evaluating these current sensors the CDK4000 Demoboard is available for every sensor type listed below.

Product	I_{PN} (A)	I_{PR} (A)	Package	Demoboard
CDS4006ABC-KA	6	18		
CDS4010ABC-KA	10	30		
CDS4015ABC-KA	15	45		
CDS4025ABC-KA	25	75		
CDS4050ABC-KA	50	150		
CDS4050ACC-KA	50	150		
CDS4100ACC-KA	100	300		
CDS4125ACC-KA	125	375		
CDS4150ACC-KA	150	450		

I_{PN}: Nominal primary current (RMS).
I_{PR}: Measurement range (For 1 s in a 60 s interval; R_M = 300 Ω).

Safety notes

⚠	**Warning!** This sensor shall be used in electric and electronic devices according to applicable standards and safety requirements. Sensitec's datasheet and handling instructions must be complied with. Handling instructions for current sensors are available at www.sensitec.com.
⚡	**Caution! Risk of electric shock!** When operating the sensor, certain parts, e. g. the primary busbar or the power supply, may carry hazardous voltage. Ignoring this warning may lead to serious injuries! Conducting parts of the sensor shall not be accessible after installation.

General information

Product status

The product is in series production.

Note: The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com.

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Life critical applications

These products are not qualified for use in life support appliances, aeronautical applications or devices or systems where malfunction of these products can reasonably be expected to result in personal injury.

MagnetoResistive Sensors

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