

CMS2005

MagnetoResistive Current Sensor ($I_{PN} = 5\text{ A}$)

Data sheet

The CMS2000 current sensor family is designed for highly dynamic electronic measurement of DC, AC, pulsed and mixed currents with integrated galvanic isolation. The MagnetoResistive technology enables an excellent dynamic response without the hysteresis that is present in iron core based designs.

The CMS2000 product family offers PCB-mountable THT current sensors from 5 A up to 50 A nominal current for industrial applications.



CMS2005

Product overview

Product description	Package	Delivery Type
CMS2005-SP3	THT	Tray
CMS2005-SP10	THT	Tray

Quick reference guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Positive supply voltage	+11.4	+15.0	+15.7	V
V_{EE}	Negative supply voltage	-11.4	-15.0	-15.7	V
I_{PN}	Primary nominal current (RMS)	-	-	5	A
I_{PR}	Primary measuring range ¹⁾	-15	-	+15	A
$\epsilon_{\Sigma,SP3}$	Overall accuracy for SP3 ²⁾	-	-	± 0.8	% of I_{PN}
$\epsilon_{\Sigma,SP10}$	Overall accuracy for SP10 ²⁾	-	-	± 0.5	% of I_{PN}
f_{co}	Upper cut-off frequency (-3 dB)	-	100	-	kHz
T_{amb}	Ambient temperature ³⁾	-25	-	+85	$^{\circ}\text{C}$

¹⁾ For 3 s in a 60 s interval and $V_{CC} = \pm 15\text{ V}$.

²⁾ $\epsilon_{\Sigma} = \epsilon_G + \epsilon_{lin}$ with $V_{CC} = \pm 15\text{ V}$, $I_P = I_{PN}$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$.

³⁾ Operating condition.

Qualification overview

Standard	Status
CE-sign EN 61010	Certified
RoHS-conform 2002/95/EC	Certified
UL Recognized Component E251279	Certified

Features

- Based on the Anisotropic Magneto Resistive (AMR) effect
- Measuring range up to 3 times nominal current
- Galvanic isolation between primary and measurement circuit
- Bipolar 15 V power supply

Advantages

- Excellent accuracy
- Low temperature drift
- Small and compact size
- Highly dynamic response
- Automatically mountable on PCB
- Integrated burden resistor
- Low primary inductance
- Negligible hysteresis

Applications

- Solar power converters
- AC variable speed drives
- Converters for DC motor drives
- Uninterruptible power supplies
- Switched mode power supplies
- Power supplies for welding applications



CMS2005

MagnetoResistive Current Sensor ($I_{PN} = 5\text{ A}$)

Absolute maximum ratings Values

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

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Positive supply voltage	-0.3	+16	V
V_{SS}	Negative supply voltage	-16	+0.3	V
I_{PM}	Maximum primary current ¹⁾	-50	+50	A
T_{amb}	Ambient temperature	-25	+85	°C
T_{stg}	Storage temperature	-25	+85	°C

¹⁾ For 20 ms in a 20 s interval.

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.

Electrical data

$T_{amb} = 25\text{ °C}$; $V_{CC} = \pm 15\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Positive supply voltage		+11.4	+15.0	+15.7	V
V_{SS}	Negative supply voltage		-11.4	-15.0	-15.7	V
I_{PN}	Primary nominal current (RMS)		-	-	5	A
I_{PR}	Measuring range ²⁾		-15	-	+15	A
V_{outN}	Nominal output voltage (RMS)	$I_P = I_{PN}$	-	2.5	-	V
R_M	Internal burden resistor for output signal		-	-	150	Ω
R_P	Resistance of primary conductor		-	-	12	m Ω
I_C	Current consumption	$I_C = 22 + (I_P/I_{PN}) \cdot 23$	22	-	91	mA

²⁾ For 3 s in a 60 s interval.

Electrical data

$T_{amb} = 25\text{ °C}$; $V_{CC} = \pm 12\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Positive supply voltage		+11.4	+12.0	+12.6	V
V_{SS}	Negative supply voltage		-11.4	-12.0	-12.6	V
I_{PN}	Primary nominal current (RMS)		-	-	5	A
I_{PR}	Measuring range ³⁾		-10	-	+10	A
V_{outN}	Nominal output voltage (RMS)	$I_P = I_{PN}$	-	2.5	-	V
R_M	Internal burden resistor for output signal		-	-	150	Ω
R_P	Resistance of primary conductor		-	-	12	m Ω
I_C	Current consumption	$I_C = 22 + (I_P/I_{PN}) \cdot 23$	22	-	91	mA

³⁾ For 3 s in a 60 s interval.

CMS2005

MagnetoResistive Current Sensor ($I_{PN} = 5\text{ A}$)

Qualifications

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_i	Isolation test voltage (RMS)	50/60 Hz, 60 s	-	3.5	-	kV
V_B	Rated voltage (RMS)	Pollution degree 2, Kat. II	-	600	-	V

Accuracy of CMS2005-SP3

$T_{amb} = 25\text{ °C}$; $V_{CC} = \pm 15\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
ϵ_{Σ}	Overall accuracy ¹⁾	$I_P = I_{PN}$	-	-	± 0.8	% of I_{PN}
ϵ_{off}	Offset error	$I_P = 0$	-	-	± 0.8	% of I_{PN}
ϵ_{Lin}	Linearity error	$I_P \leq I_{PN}$	-	-	± 0.1	% of I_{PN}
$T\epsilon_G$	Maximum temperature induced gain error	$T_{amb} = (-25\dots+85)\text{ °C}$	-	-	150	ppm/K
$T\epsilon_{off}$	Maximum temperature induced offset error	$T_{amb} = (-25\dots+85)\text{ °C}$	-	-	± 1.0	% of I_{PN}

¹⁾ $\epsilon_{\Sigma} = \epsilon_G + \epsilon_{Lin}$ with ϵ_G = gain error and ϵ_{Lin} = linearity error

Accuracy of CMS2005-SP10

$T_{amb} = 25\text{ °C}$; $V_{CC} = \pm 15\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
ϵ_{Σ}	Overall accuracy ²⁾	$I_P = I_{PN}$	-	-	± 0.5	% of I_{PN}
ϵ_{off}	Offset error	$I_P = 0$	-	-	± 0.2	% of I_{PN}
ϵ_{Lin}	Linearity error	$I_P \leq I_{PN}$	-	-	± 0.1	% of I_{PN}
$T\epsilon_G$	Maximum temperature induced gain error	$T_{amb} = (-25\dots+85)\text{ °C}$	-	-	150	ppm/K
$T\epsilon_{off}$	Maximum temperature induced offset error	$T_{amb} = (-25\dots+85)\text{ °C}$	-	-	± 1.0	% of I_{PN}

²⁾ $\epsilon_{\Sigma} = \epsilon_G + \epsilon_{Lin}$ with ϵ_G = gain error and ϵ_{Lin} = linearity error

Dynamic data

$T_{amb} = 25\text{ °C}$; $V_{CC} = \pm 15\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t_{ra}	Reaction time	10% I_{PN} to 10% I_{out}	-	-	0.15	μs
t_{ri}	Rise time	10% to 90% I_{out}	-	-	1.7	μs
f_{co}	Upper cut-off frequency	-3 dB	-	100	-	kHz

General data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T_{amb}	Ambient temperature		-25	-	+85	$^{\circ}\text{C}$
T_{stg}	Storage temperature		-25	-	+85	$^{\circ}\text{C}$
T	Solder temperature	For 7 seconds.	-	-	250	$^{\circ}\text{C}$
m	Mass		-	4.0	-	g

CMS2005

MagnetoResistive Current Sensor ($I_{PN} = 5\text{ A}$)

PCB Layout

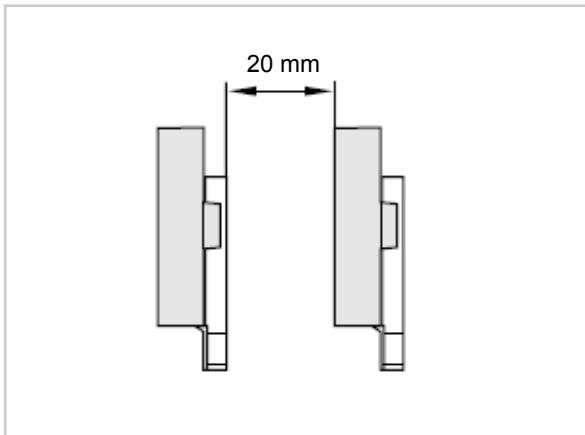


Fig.3: Recommended clearance among each other.

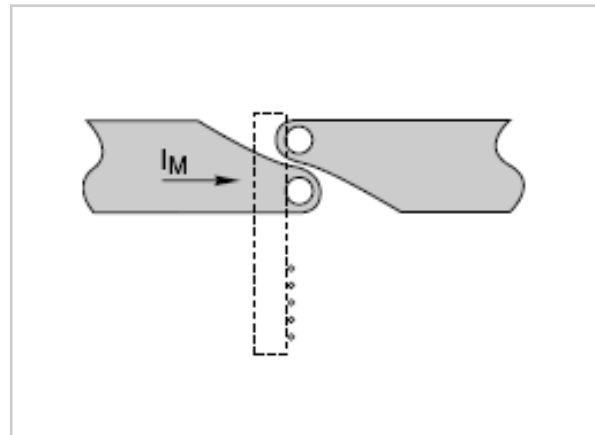


Fig.4: Recommended current path layout.

The CMS2000 product family

The CMS2005 is a member of the CMS2000 product family offering PCB-mountable THT current sensors from 5 A up to 50 A nominal current for various industrial applications.

Product	I_{PN} (A)	I_{PR} (A)	ϵ_{Σ} (% of I_{PN})	ϵ_{off} (% of I_{PN})	$T\epsilon_{off}$ (% of I_{PN})	Package
CMS2005-SP3	5	15	± 0.8	± 0.8	± 1.0	
CMS2005-SP10	5	15	± 0.5	± 0.2	± 1.0	
CMS2015-SP3	15	45	± 0.8	± 0.8	± 1.0	
CMS2015-SP10	15	45	± 0.5	± 0.2	± 1.0	
CMS2025-SP3	25	75	± 0.8	± 0.8	± 1.0	
CMS2025-SP10	25	75	± 0.5	± 0.2	± 1.0	
CMS2050-SP3	50	150	± 0.8	± 0.8	± 1.0	
CMS2050-SP7	50	220	± 0.8	± 1.6	± 0.9	
CMS2050-SP10	50	150	± 0.5	± 0.2	± 1.0	

I_{PN} : Nominal primary current (RMS).



I_{PR} : Measurement range for 3 s in a 60 s interval (@SP7 only 20 ms in a 2 s interval).

ϵ_{Σ} : Overall accuracy $\epsilon_{\Sigma} = \epsilon_G + \epsilon_{in}$ with $V_{CC} = \pm 15\text{ V}$, $I_P = I_{PN}$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$.

ϵ_{off} : Offset error with $V_{CC} = \pm 15\text{ V}$, $I_P = 0$ and $T_{amb} = 25\text{ }^{\circ}\text{C}$.

$T\epsilon_{off}$: Maximum temperature induced offset error with $T_{amb} = (-25\dots+85)\text{ }^{\circ}\text{C}$.

Safety notes

	<p>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.</p>
	<p>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.</p>

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.

Disclaimer

Sensitec GmbH reserves the right to make changes, without notice, in the products, including software, described or contained herein in order to improve design and/or performance. Information in this document is believed to be accurate and reliable. However, Sensitec GmbH does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Sensitec GmbH takes no responsibility for the content in this document if provided by an information source outside of Sensitec products.

In no event shall Sensitec GmbH be liable for any indirect, incidental, punitive, special or consequential damages (including but not limited to lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) irrespective the legal base the claims are based on, including but not limited to tort (including negligence), warranty, breach of contract, equity or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Sensitec product aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the General Terms and Conditions of Sale of Sensitec GmbH.

Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Unless otherwise agreed upon in an individual agreement Sensitec products sold are subject to the General Terms and Conditions of Sales as published at www.sensitec.com.

Application information

Applications that are described herein for any of these products are for illustrative purposes only. Sensitec GmbH makes no representation or warranty – whether expressed or implied – that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Sensitec products, and Sensitec GmbH accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Sensitec product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Sensitec GmbH does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Sensitec products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Sensitec does not accept any liability in this respect.

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

Sensitec GmbH
Georg-Ohm-Straße 11
35633 Lahnau
Germany
Fon +49 (0) 6441 9788-0
Fax +49 (0) 6441 9788-17
E-Mail info@sensitec.com
www.sensitec.com

Solutions for measuring:

- Position
- Angle
- Magnetic field
- Current

Copyright © 2012 by Sensitec GmbH, Germany

All rights reserved. No part of this document may be copied or reproduced in any form or by any means without the prior written agreement of the copyright owner. The information in this document is subject to change without notice. Sensitec GmbH does not assume any liability for any consequence of its use.