

K-No.: 27109

3A Differential Current Sensor for 5V Supply Voltage

For the electronic measurement of current:
DC, AC, pulsed ..., with galvanic isolation between the primary and the secondary circuit



Date: 29.06.2023

Customer: Standard type

Customers Part no:

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Description

- Closed loop (compensation) Current Sensor with magnetic probe
- Printed circuit board mounting
- Casing and materials UL-listed

Characteristics

- excellent accuracy
- very low offset current
- very low temperature dependency and offset drift
- very low hysteresis of offset current
- short response time
- wide frequency bandwidth
- compact design
- reduced offset ripple

Applications

- Mainly used for stationary operation in industrial applications:
- Solar inverter

Electrical data - Ratings

I_{PN}	Primary nominal RMS current	200	A
$I_{\Delta N}$	Differential rated RMS current	3	A
V_{OUT}	Output voltage @ $I_{\Delta P}$	$V_{REF} \pm (1.2 * I_{\Delta P} / I_{\Delta N})$	V
$V_{OUT(0)}^1$	Output voltage @ $I_P=0A, \vartheta_A=25^\circ C$	$V_{REF} \pm 0.01$	V
$V_{OUT(Error)}$	in case of error (current sensor) $V_{OUT} < 0.5V$ is set	< 0.5	V
V_{REF}	internal reference voltage	2.5 ± 0.005	V
	external reference voltage range	1.4...3.5	V
$V_{REF(test\ current)}^2$	Reference voltage (external)	0 ... 0.1	V
$V_{OUT(test\ current)}^2$	Output voltage @ $V_{REF} = 0...0.1V$	$V_{OUT(0)} + 0.17 \pm 0.06$	V
K_N	Transformation ratio	(1) : 1000	
	Turns count for test winding	20	

¹ with switching on and after "test current" the sensor is degaussed by an internal AC-current for about 110ms. In this time the output is set to $V_{OUT} < 0.5V$.

² If V_{REF} is set external to 0...0.1V an internal test current is generated.

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{\Delta P,max}$	Max. measuring range (differential current)	± 5			A
X	Accuracy @ $I_{PN}, \vartheta_A = 25^\circ C$			1.5	%
ϵ_L	Linearity			1	%
$V_O (V_{OUT}-V_{REF})$	Offset voltage @ $I_P = 0A, \vartheta_A = 25^\circ C$	-10		10	mV
$\Delta V_O / \Delta \vartheta$	Temperature drift of V_{OUT} @ $I_P=0A, \vartheta_A$		0.06		mV/K
t_r	Response time @ 90% of $I_{\Delta N}$		30		μs
f	Frequency bandwidth	DC...10			kHz

General data

ϑ_A	Ambient operation temperature	-40		85	$^\circ C$
ϑ_S	Ambient storage temperature (acc. to M3101)	-40		85	$^\circ C$
m	Mass		93		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Supply current at $I_P = 0A$ and RT		14		mA

$^1 S_{clear}$	Clearance (component without solder pad)	8			mm
$^1 S_{creep}$	Creepage (component without solder pad)	10			mm
$^1 U_{sys, re}$	System voltage (reinforced insulation)			600	V_{RMS}
$^1 U_{work, re}$	Working voltage (reinforced insulation)			1000	V_{RMS}
$^1 U_{PD}$	Rated discharge voltage			1414	V_{PEAK}
$^1 U_{sys, basic}$	System voltage (basic insulation)			1000	V_{RMS}
$^1 U_{work, basic}$	Working voltage (basic insulation)			2000	V_{RMS}

¹Constructed, manufactured and tested in accordance with IEC 61800-5-1:2007
Insulation material group 1, Pollution degree 2, Overvoltage category III

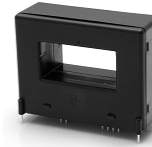
Date	Name	Issue	Amendment
29.06.2023	DJ	81	Mechanical Outline: "The arrow does not necessarily have to be printed on the sensor." added. Minor change
18.02.2022	NSch.	81	Other instructions on sheet 3 changed. „The color of the plastic material... added. Minor change

Hrg.: R&D-PD NPI D editor	Bearb.: DJ designer	MC-PM: NSch. check	freig.: SB released
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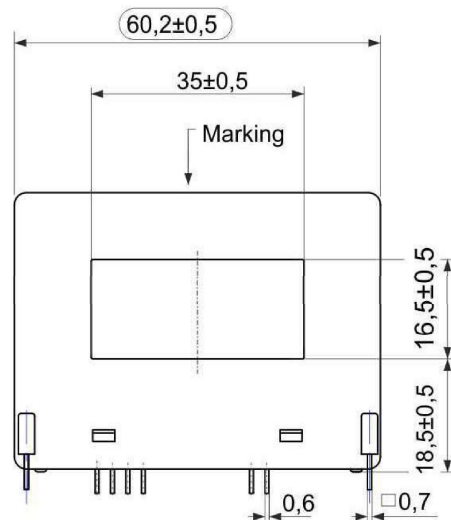
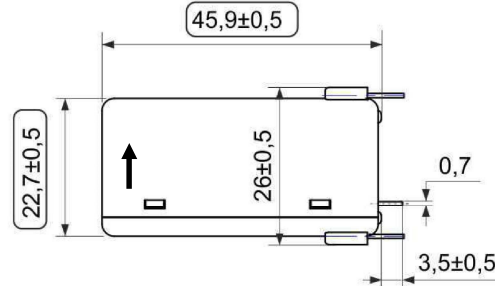
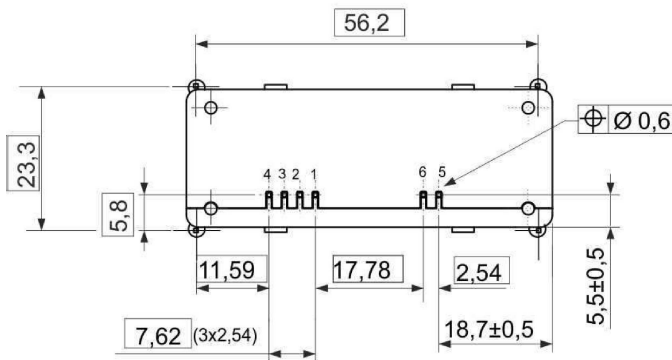
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Mechanical outline (mm):

General tolerances DIN ISO 2768-c

DC = Date Code
F = Factory

test dimension



The arrow does not necessarily have to be printed on the sensor.

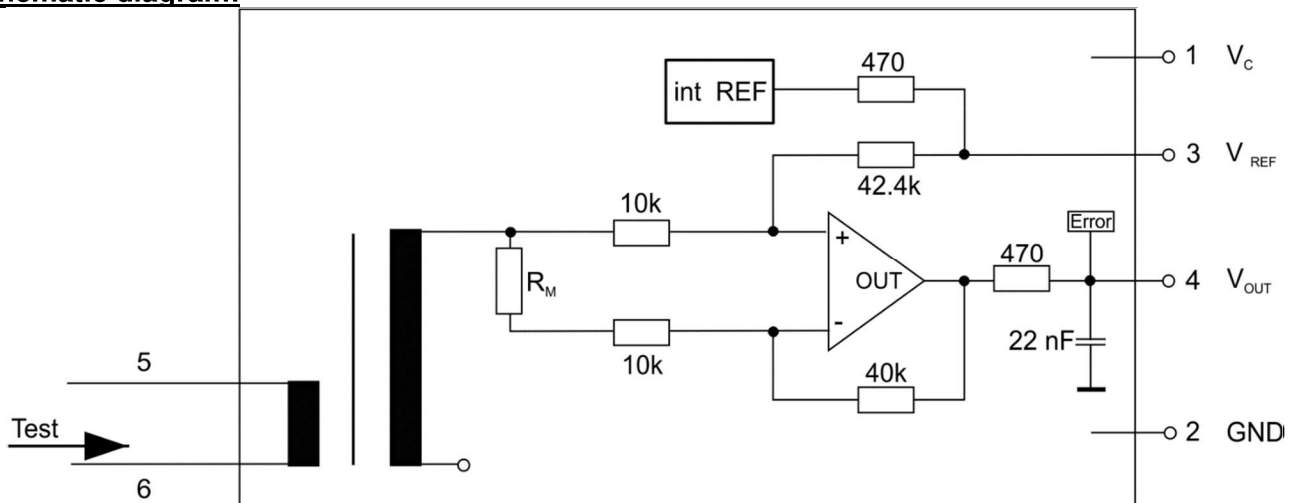
Marking:

VAC
UL-sign
4647-P982
F DC

Format DC: YYWW

Example: 1912:
Year 2019, Week 12

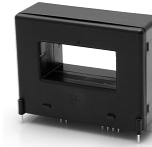
Schematic diagram:



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Electrical data: (investigate by a type checking)

		min.	typ.	max.	Unit
$V_{C,max}$	maximum supply voltage (without function)			6	V
I_c	Supply current with primary current	$16mA + I_{\Delta P} \cdot K_N + V_{OUT}/R_L$			mA
$I_{OUT,SC}$	Short circuit output current		± 20		mA
R_s	Secondary coil resistance @ $\vartheta_A = 85^\circ C$		55		Ω
$R_{i,REF}$	Internal resistance of reference input		470		Ω
$R_{i,OUT}$	Output resistance of V_{OUT}		470		Ω
$\Delta X_{\vartheta}/\Delta \vartheta$	Temperature drift of X @ $\vartheta_A = -40^\circ C \dots 85^\circ C$			400	ppm/K
$\Delta V_{REF}/\Delta \vartheta$	Temperature drift of V_{REF} @ $\vartheta_A = -40^\circ C \dots 85^\circ C$		5	50	ppm/K
$\Delta V_{O=}$ $\Delta(V_{OUT}-V_{REF})$	Sum of any offset drift included:		10		mV
V_{Ot}	Long term drift of V_O		5		mV
$V_{O\vartheta}$	Temperature drift of V_O @ $\vartheta_A = -40^\circ C \dots 85^\circ C$		5		mV
$\Delta V_O/\Delta V_C$	Supply voltage rejection ratio		4		mV/V
V_{OH}	Hysteresis of V_{OUT} @ $I_P = 0$ (after an overload of $100 \times I_{\Delta N}$)		25	40	mV
$V_{OH, Demag}$	Hysteresis after Degaussing		5	15	mV
v_{OSS}	Offsetripple (without external filter)		32		mV _{PP}
v_{OSS}	Offsetripple (with 20 kHz-Filter, first order)		5		mV _{PP}
v_{OSS}	Offsetripple (with 1 kHz-Filter, first order)		0.6		mV _{PP}
	Mechanical stress according to M3209/3 Settings: 10-2000Hz, 1min/Octave, 2 hours		2		g

Routine Tests: (Measurement after temperature balance of the samples at room temperature, SC=significant characteristic)

$V_{OUT} (SC)$	(100%) M3011/6:	Output voltage	1182 ... 1218	mV
V_O	(100%) M3226:	Offset voltage	± 10	mV
U_d	(100%) M3014:	Test voltage, 1s	1.8	kV _{RMS}
U_{PDE}	(AQL 1/S4)	Partial discharge voltage (extinction)	1.5	kV _{RMS}
$U_{PDE} * 1.875$	M3024:		1.875	

Type Tests: (Precondition acc. M3236)

\hat{U}_W	M3064:	HV Impulse test (1.2 μ s/50 μ s wave form) 5 pulses -> polarity +, 5 pulses -> polarity -	8	kV
U_d	M3014:	Test voltage, 60s	3.6	kV _{RMS}
U_{PDE}	M3024:	Partial discharge voltage (extinction)	1.5	kV _{RMS}
$U_{PDE} * 1.875$			1.875	

Other instructions

- A positive output voltage appears at point V_{OUT} vs. V_{REF} , if primary current flows in direction of the arrow.
- Temperature of the primary conductor should not exceed $105^\circ C$.
- Housing and bobbin material UL-listed: Flammability class 94V-0.
- Housing without red phosphorous.
- Further standards: UL 508, file E317483, category NMTR2 / NMTR8
- The color of the plastic material is not specified and the current sensor can be supplied in different colors (e.g. brown, black, white, natural). This has no effect on the specifications or UL approval

Hrg.: R&D-PD NPI D
editor

Bearb.: DJ
designer

MC-PM: NSch.
check

freig.: SB
released