

K-No.:27107

1A 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: 18.02.2022

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	150	A
$I_{\Delta N}$	Differential rated RMS current	1.0	A
V_{OUT}	Output voltage @ $I_{\Delta P}$	$V_{REF} \pm (0.74 * I_{\Delta P} / I_{\Delta N})$	V
$V_{OUT(0)}^1$	Output voltage @ $I_P=0A, \theta_A=25^\circ C$	$V_{REF} \pm 0.015$	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 @ $V_{REF} = 0...0.1V$	$V_{OUT(0)} + 0.25 \pm 0.06$	V
K_N	Transformation ratio	1 : 1 : 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)	± 3			A
X	Accuracy @ $I_{PN}, \theta_A = 25^\circ C$			1.5	%
ϵ_L	Linearity			1	%
$V_O (V_{OUT}-V_{REF})$	Offset voltage @ $I_P = 0A, \theta_A = 25^\circ C$	-15		15	mV
$\Delta V_O / \Delta \theta$	Temperature drift of V_{OUT} @ $I_P=0A, \theta_A$		0.07		mV/°C
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	°C
θ_S	Ambient storage temperature (acc. to M3101)	-40		85	°C
m	Mass		175		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Supply current @ $I_P = 0A$		14		mA

¹ S_{clear}	Clearance (component without solder pad)	12			mm
¹ S_{creep}	Creepage (component without solder pad)	13			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)			1500	V_{RMS}
¹ $U_{work, basic}$	Working voltage (basic insulation)			2500	V_{RMS}

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

Date	Name	Issue	Change
18.02.2022	NSch.	81	Other instructions on sheet 3 changed. „The color of the plastic material... added. Minor change

Editor: R&D-PD CS	Designer: DJ	MC-PM: NSch.	Release: SB
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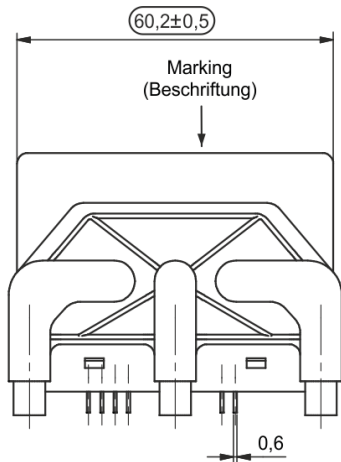
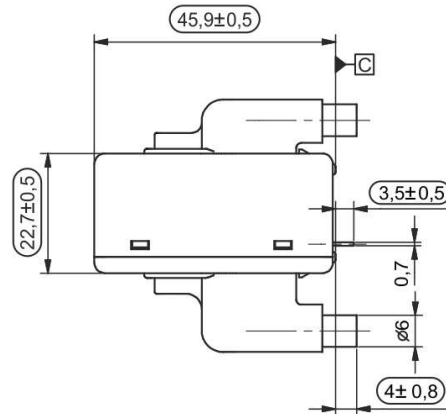
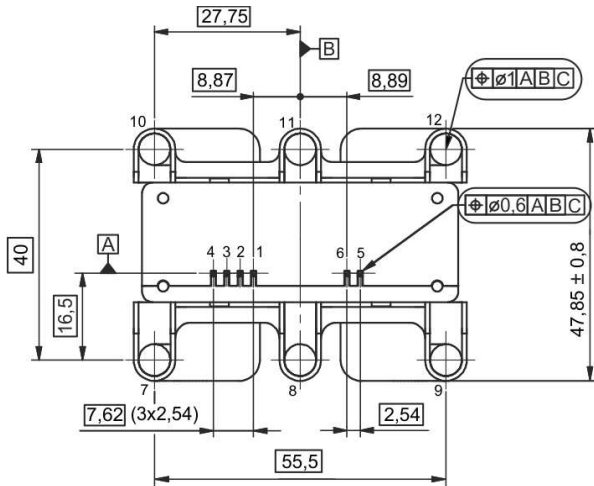
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Mechanical outline (mm):

General tolerances DIN ISO 2768-c



DC = Date Code ◯ test dimension
F = Factory

Connections:

1-6: 0.7 x 0.6mm
7-12: Ø 6mm

Marking:

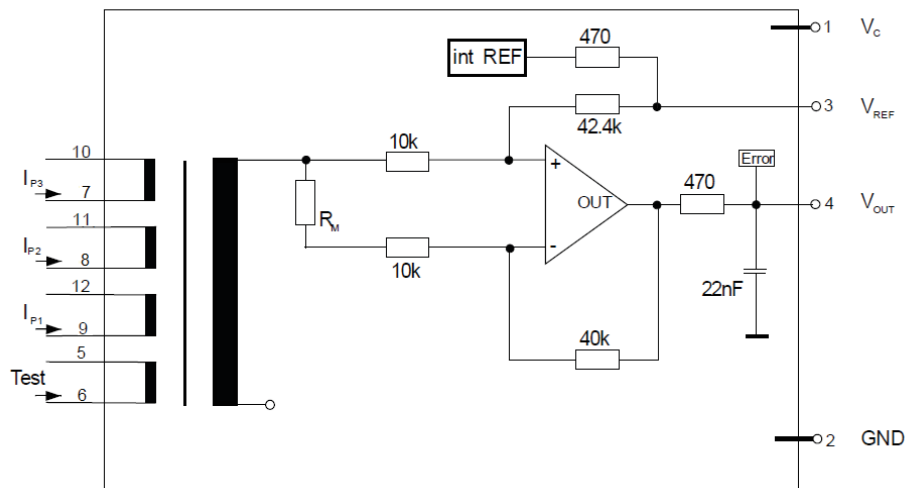


UL-sign
4647-P983
F DC

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	$16mA + I_{\Delta P} * K_N + V_{OUT}/R_L$			mA
$I_{OUT,SC}$	Short circuit output current		± 20		mA
R_S	Secondary coil resistance @ $\theta_A = 85^\circ C$		55		Ω
R_P	Resistance of primary conductor @ $\theta_A = 25^\circ C$		0.07		m Ω
$R_{i,REF}$	Internal resistance of reference input		470		Ω
$R_{i,OUT}$	Output resistance of V_{OUT}		470		Ω
$\Delta X_\theta / \Delta \theta$	Temperature drift of X @ $\vartheta_A = -40^\circ C \dots 85^\circ C$			400	ppm/K
$\Delta V_{REF} / \Delta \theta$	Temperature drift of V_{REF} @ $\vartheta_A = -40^\circ C \dots 85^\circ C$		5	50	ppm/K
$\Delta V_{O=}$	Sum of any offset drift included:		17		mV
V_{Ot}	Long term drift of V_O		7		mV
$V_{O\theta}$	Temperature drift of V_O @ $\vartheta_A = -40^\circ C \dots 85^\circ C$		8		mV
$\Delta V_O / \Delta V_C$	Supply voltage rejection ratio		3.5		mV/V
V_{OH}	Hysteresis of V_{OUT} @ $I_P = 0$ (after an overload of $800x I_{\Delta N}$)		35	65	mV
$V_{OH, Demag}$	Hysteresis after Degaussing		8	25	mV
V_{OSS}	Offsetripple (without external filter)		180		mV _{PP}
V_{OSS}	Offsetripple (with 100kHz-Filter, first order)		22		mV _{PP}
V_{OSS}	Offsetripple (with 20kHz-Filter, first order)		9		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	729 ... 751	mV
V_O	(100%) M3226: Offset voltage	15	mV
U_d	(100%) M3014: Test voltage, 1s	1.8	kV _{RMS}
U_{PDE}	(AQL 1/S4)	1.5	kV _{RMS}
$U_{PD*1.875}$	M3024: Partial discharge voltage (extinction)	1.875	kV _{RMS}

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}		1.5	kV _{RMS}
$U_{PD*1.875}$	M3024: Partial discharge voltage (extinction)	1.875	kV _{RMS}

Other instructions

- A positive output voltage appears at point V_{OUT} , if primary current flows in direction of the arrow.
- Temperature of the primary conductor should not exceed 105°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.

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