

K-No.:30261

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: 25.09.2020

Customer: Standard type

Customers Part no:

Page 1 of 3

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 and 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 : 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
$I_{\Delta N,max}$	Max. measuring range (differential current)	± 5			A
X	Accuracy @ $I_{PN}, \vartheta_A = 25^\circ C$			1.5	%
ϵ_L	Linearity			1	%
V_O	Offset voltage @ $I_P = 0A, \vartheta_A = 25^\circ C$			10	mV
$\Delta V_O / \Delta \vartheta$	Temperature drift of V_{OUT} @ $I_P=0A, \vartheta_A$		0.06		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 air temperature	-40		105	°C
ϑ_S	Ambient storage temperature (acc. to M3101)	-40		105	°C
ϑ_{busbar}	Permissible temperature of primary conductor			115	°C
m	Mass		175		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Supply current at $I_P = 0A$ and RT		15		mA
¹⁾ $S_{clear, pri-sec}$	Clearance (component without solder pad)	12			mm
¹⁾ $S_{creep, pri-sec}$	Creepage (component without solder pad)	13			mm
¹⁾ $S_{clear, pri-pri}$	Clearance	7			mm
¹⁾ $S_{creep, pri-pri}$	Creepage	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)			1500	V_{RMS}
¹⁾ $U_{work, basic}$	Working voltage (basic insulation)			2500	V_{RMS}

¹⁾Constructed 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	Amendment
25.09.2020	DJ	81	Customer approval. Marking with UL-sign and other standards changed. Minor change.
22.09.2020	Sc.	81	Marking with UL-sign after customer approval. CN-20-086

Editor: R&D-PD NPI D Designer: DJ MC-PM: NSch. Released: SB

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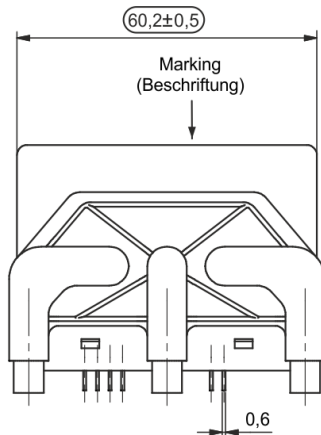
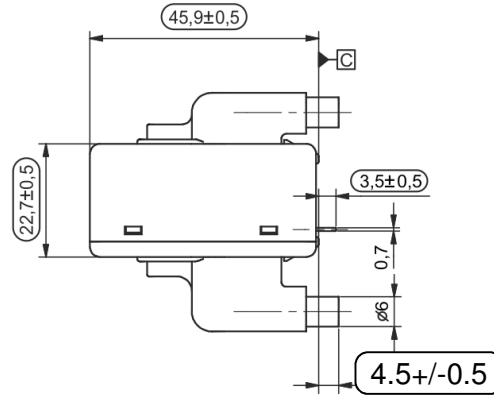
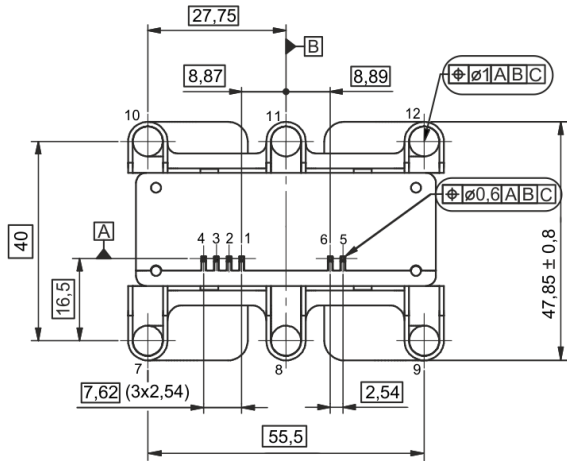
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Page 2 of 3

Mechanical outline (mm):

General tolerances DIN ISO 2768-c



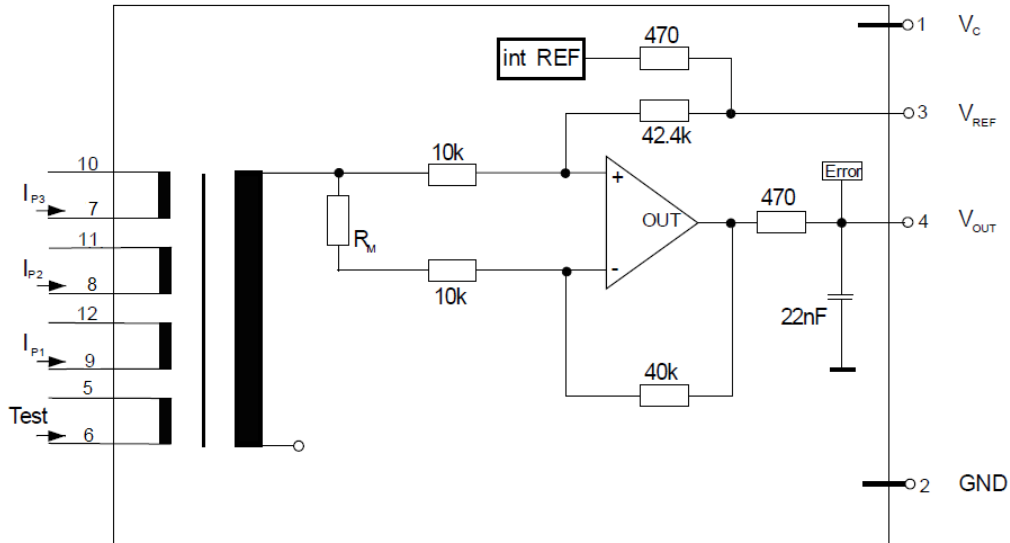
DC = Date Code ◯ test dimension
F = Factory

Marking:

VAC UL-sign
4647-P985
F DC

Format DC: YYWW

Schematic diagram:



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Page 3 of 3

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	$15mA + I_{\Delta P} * K_N + V_{OUT}/R_L$			mA
$I_{OUT,SC}$	Short circuit output current		± 20		mA
R_S	Secondary coil resistance @ $\vartheta_A = 85^\circ C$		55		Ω
R_P	Resistance of primary conductor @ $\vartheta_A = 25^\circ C$		0.07		m Ω
$R_{i,REF}$	Internal resistance of reference input		470		Ω
$R_{i,OUT}$	Output resistance of V_{OUT}		470		Ω
$\Delta X_{\vartheta}/\Delta \vartheta$	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 $800 \times I_{\Delta N}$)		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 70 kHz-Filter, first order)		15		mV _{PP}
V_{OSS}	Offsetripple (with 1.6 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} $U_{PDE} * 1.875$	(AQL 1/S4) M3024	Partial discharge voltage (extinction)	1.5 1.875	kV _{RMS}

Type Tests: (Precondition acc. M3236, Tested between primary and secondary circuit)

$\hat{U}_W, basic$	M3064	HV Impulse voltage (1.2 μ s/50 μ s wave form) 5 pulses -> polarity +, 5 pulses -> polarity -	10.5	kV
$U_d, basic$	M3014	Test voltage, 60s	5	kV _{RMS}
U_{PDE} $U_{PDE} * 1.875$	M3024	Partial discharge voltage (extinction)	1.5 1.875	kV _{RMS}

Other instructions

- A positive output voltage appears at point V_{OUT} vs. V_{REF} , if primary current flows in direction of the arrow.
- Requirement to fulfil UL requirements: operation temperature range: -40 ... 70°C
- Housing and bobbin material UL-listed: Flammability class 94V-0.
- Housing without red phosphorous.
- Further standards: UL 508 file E317483, category NMTR2 / NMTR8