

K-no.: 24508

15 A Current Sensor Module for 5V- Supply Voltage
Date: 08.04.2008

 For electronic current measurement:
 DC, AC, pulsed, mixed ..., with a galvanic
 isolation between primary circuit
 (high power) and secondary circuit
 (electronic circuit)

Customer: Standard type

Customers Part no.:
Page 1 **of** 2

Description

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

Characteristics

- Excellent accuracy
- Very low offset current
- Very low temperature dependency and offset current 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:

- AC variable speed drives and servo motor drives
- Static converters for DC motor drives
- Battery supplied applications
- Switched Mode Power Supplies (SMPS)
- Power Supplies for welding applications
- Uninterruptible Power Supplies (UPS)

Electrical data – Ratings

| | | | |
|-----------|--|--------------------------------------|---|
| I_{PN} | Primary nominal r.m.s. current | 15 | A |
| V_{out} | Output voltage @ I_P | $2.5 \pm (0.625 \cdot I_P / I_{PN})$ | V |
| V_{out} | Output voltage @ $I_P=0, T_A=25^\circ\text{C}$ | 2.5 ± 0.020 | V |
| V_{Ref} | Reference voltage | 2.5 ± 0.005 | V |
| K_N | Turns ratio | 1...3 : 2000 | |

Accuracy – Dynamic performance data

| | | min. | typ. | max. | Unit |
|------------------------------------|--|----------|------|------|-------|
| $I_{P,max}$ | Max. measuring range | ±51 | | | |
| X | Accuracy @ $I_{PN}, T_A=25^\circ\text{C}$ | 0.7 | | | % |
| ϵ_L | Linearity | 0.1 | | | % |
| $V_{out} -2,5V$ | Offset voltage @ $I_P=0, T_A=25^\circ\text{C}$ | ±20 | | | mV |
| $\Delta V_{out} / 2,5V / \Delta T$ | Temperatur drift of V_{out} @ $I_P=0, T_A= -40...85^\circ\text{C}$ | 16 | | 32 | ppm/K |
| t_r | Response time @ 90% von I_{PN} | 300 | | | ns |
| $\Delta t (I_{P,max})$ | Delay time at $di/dt = 100 \text{ A}/\mu\text{s}$ | 200 | | | ns |
| f | Frequency bandwidth | DC...100 | | | kHz |

General data

| | | min. | typ. | max. | Unit |
|-------|-------------------------------|------|------|------|------|
| T_A | Ambient operating temperature | -40 | | +85 | °C |
| T_S | Ambient storage temperature | -40 | | +85 | °C |
| m | Mass | 12 | | | g |
| V_C | Supply voltage | 4.75 | 5 | 5.25 | V |
| I_C | Current consumption | 15 | | | mA |

 Constructed and manufactured and tested in accordance with EN 61800-5-1 (Pin 1 - 6 to Pin 7 – 9)
 Reinforced insulation, Insulation material group 1, Pollution degree 2

| | | | | | |
|-------------|--|---|-----|------|----|
| S_{clear} | Clearance (component without solder pad) | 7 | | | mm |
| S_{creep} | Creepage (component without solder pad) | 7 | | | mm |
| V_{sys} | System voltage | overvoltage category 3 | RMS | 300 | V |
| V_{work} | Working voltage | (tabel 7 acc. to EN61800-5-1) overvoltage category 2 | RMS | 650 | V |
| U_{PD} | Rated discharge voltage | peak value | | 1320 | V |

| Date | Name | Issue | Amendment |
|----------|------|-------|----------------------|
| 08.04.08 | Le | 82 | "preliminary" delete |

 Hrsg.: KB-E
 editor

 Bearb.: Le
 designer

 KB-PM: KRe
 check

 freig.: Heu.
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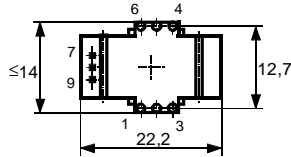
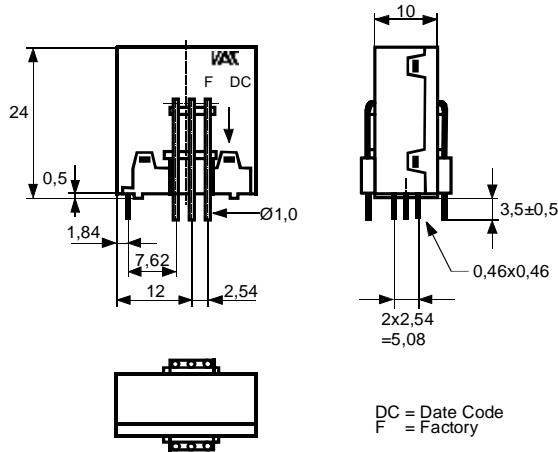
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Mechanical outline (mm):

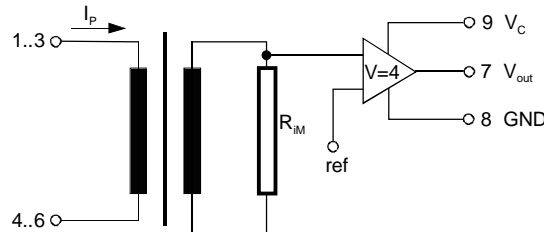
General tolerances DIN ISO 2768-c

Connections:

 1...6: \varnothing 1 mm
 7...9: 0,46*0,46 mm

 Toleranz der Stiftabstände
 $\pm 0,2$ mm
 (Tolerances grid distance)

Marking:

 4646X652
 F DC

 DC = Date Code
 F = Factory

Schematic diagram

Possibilities of wiring (@ $T_A = 85^\circ\text{C}$)

| primary windings | primary current RMS | primary current maximal | output voltage RMS | turns ratio | primary resistance | wiring |
|------------------|---------------------|-------------------------|-----------------------|-------------|--------------------|--------|
| N_P | I_P [A] | $\hat{I}_{P,max}$ [A] | $V_{out}(I_{PN})$ [V] | K_N | R_P [mW] | |
| 1 | 15 | ± 51 | 2.5 ± 0.625 | 1:2000 | 0.33 | |
| 2 | 7,5 | ± 25 | 2.5 ± 0.625 | 2:2000 | 1.5 | |
| 3 | 5 | ± 17 | 2.5 ± 0.625 | 3:2000 | 3 | |

 Temperature of the primary conductor should not exceed 110°C .
 Additional information is obtainable on request.
 This specification is no declaration of warranty acc. BGB §443 dar.

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Electrical Data

| | | min. | typ. | max. | Unit |
|---------------------------------------|---|------|--------------------------------------|------|------------|
| V_{Ctot} | Maximum supply voltage (without function) | | | 6 | V |
| I_C | Supply Current with primary current | | 15mA + $I_p \cdot K_N + V_{out}/R_L$ | | mA |
| $I_{out,SC}$ | Short circuit output current | | ± 20 | | mA |
| R_P | Resistance / primary winding @ $T_A=25^\circ C$ | | 1 | | m Ω |
| R_S | Secondary coil resistance @ $T_A=85^\circ C$ | | | 67 | Ω |
| $R_{i,(V_{out})}$ | Output resistance of V_{out} | | | 1 | Ω |
| R_L | External recommended resistance of V_{out} | 1 | | | k Ω |
| C_L | External recommended capacitance of V_{out} | | | 500 | pF |
| $\Delta X_T/\Delta T$ | Temperature drift of X @ $T_A = -40 \dots +85^\circ C$ | | | 40 | ppm/K |
| $\Delta V_0 = \Delta(V_{out} - 2.5V)$ | Sum of any offset drift including: | | 6 | 12 | mV |
| V_{0t} | Long term drift of V_0 | | 2 | | mV |
| V_{0T} | Temperature drift von V_0 @ $T_A = -40 \dots +85^\circ C$ | | 5 | | mV |
| V_{0H} | Hysteresis of V_{out} @ $I_P=0$ (after an overload of $10 \times I_{PN}$) | | 3 | | mV |
| $\Delta V_0/\Delta V_C$ | Supply voltage rejection ratio | | | 1 | mV/V |
| V_{oss} | Offsetripple (with 1 MHz- filter first order) | | | 70 | mV |
| V_{oss} | Offsetripple (with 100 kHz- filter first order) | | 5.5 | 11 | mV |
| V_{oss} | Offsetripple (with 20 kHz- filter first order) | | 1.5 | 3 | mV |
| C_k | Maximum possible coupling capacity (primary – secondary) | | 5 | 10 | pF |
| | Mechanical stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Decade, 2 hours | | | 30g | |

Inspection (Measurement after temperature balance of the samples at room temperature)

| | | | | | |
|------------------------|------------|----------|---|----------------|--------|
| $V_{out} (I_P=I_{PN})$ | (V) | M3011/6: | Output voltage vs. internal reference ($I_P=15A$, 40-80Hz) | 625 \pm 0.7% | mV |
| $V_{out}-2.5V (I_P=0)$ | (V) | M3226: | Offset voltage | ± 0.020 | V |
| V_d | (V) | M3014: | Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 9 | 1.5 | kV |
| V_e | (AQL 1/S4) | | Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS) | 1400 1750 | V V |

Type Testing (Pin 1 - 6 to Pin 7 - 9)

Designed according standard EN 50178 with insulation material group 1

| | | | | | | |
|-------|--|--|--|--------------|--------|----|
| V_W | | | HV transient test according (to M3064) (1,2 μs / 50 μs -wave form) | 8 | kV | |
| V_d | | | Testing voltage to M3014 | (5 s) | 3 | kV |
| V_e | | | Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS) | 1400 1750 | V V | |

Applicable documents

 Current direction: A positive output current appears at point I_S , by primary current in direction of the arrow.
 Housing and bobbin material UL-listed: Flammability class 94V-0.
 Enclosures according to IEC529: IP50.

| Datum | Index | Änderung |
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Explanation of several of the terms used in the tablets (in alphabetical order)

t_r : Response time (describe the dynamic performance for the specified measurement range), measured as delay time at $I_P = 0,9 \cdot I_{PN}$ between a rectangular current and the output voltage $V_{out}(I_P)$

$\Delta t(I_{Pmax})$: Delay time (describe the dynamic performance for the rapid current pulse rate e.g short circuit current) measured between I_{Pmax} and the output voltage $V_{out}(I_{Pmax})$ with a primary current rise of $di_P/dt \geq 100 A/\mu s$.

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e
 $U_{PD} = \sqrt{2} \cdot V_e / 1,5$

V_{vor} Defined voltage is the RMS value of a sinusoidal voltage with peak value of $1,875 \cdot U_{PD}$ required for partial discharge test in IEC 61800-5-1
 $V_{vor} = 1,875 \cdot U_{PD} / \sqrt{2}$

V_{sys} System voltage RMS value of rated voltage according to IEC 61800-5-1

V_{work} Working voltage voltage according to IEC 61800-5-1 which occurs by design in a circuit or across insulation

V_o : Offset voltage between V_{out} and the rated reference voltage of $V_{ref} = 2,5V$.
 $V_o = V_{out}(0) - 2,5V$

V_{0H} : Zero variation of V_o after overloading with a DC of tenfold the rated value

V_{0t} : Long term drift of V_o after 100 temperature cycles in the range -40 bis 85 °C.

X : Permissible measurement error in the final inspection at RT, defined by

$$X = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{out}(0)}{0,625V} - 1 \right| \%$$

$X_{ges}(I_{PN})$: Permissible measurement error including any drifts over the temperature range by the current measurement I_{PN}

$$X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - 2,5V}{0,625V} - 1 \right| \% \quad \text{or} \quad X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{ref}}{0,625V} - 1 \right| \%$$

ϵ_L : Linearity fault defined by $e_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$

This "Additional information" is no declaration of warranty according BGB §443.

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