

## CURRENT SENSOR

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PRODUCT SERIES: STB-LA/ZR  
STB-LA3/ZR

PRODUCT PART NUMBER: STB-250LA/ZNR  
STB-250LA/ZR  
STB-250LA3/ZNR  
STB-250LA3/ZN

VERSION: Ver 1.3



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## 1. Description

STB-LA/ZNR series current sensors are based on close loop principle with TMR technology. The sensor can detect the current with DC, AC, pulse and irregular wave shape.

### Typical application

- Solar inverter
- Uninterruptible Power Supplies (UPS)
- Variable frequency converter
- Direct-current dynamo
- Switched model power supplies (SMPS)

### General parameters

| Parameter                              | Symbol | Unit | Value     | Remark             |
|----------------------------------------|--------|------|-----------|--------------------|
| Working temperature                    | T_A    | °C   | -40 ~ 105 | 105°C, I(max)=420A |
| Storage temperature                    | T_stg  | °C   | -40 ~ 105 |                    |
| Limit temperature of primary conductor | T_LP   | °C   | 105       |                    |
| Mass                                   | m      | g    | 59        | STB-xxxLA/ZNR      |

### Absolute parameters

| Parameters                    | Symbol    | Unit | Value              |
|-------------------------------|-----------|------|--------------------|
| Supply voltage                | Vcc_max   | V    | 6                  |
| Maximum primary current       | I_p_max   | A    | 10*I_pn            |
| ESD rating (HBM)              | U_ESD_HBM | kV   | 4                  |
| High temperature and humidity | T_HAST    | -    | 85°C&85%RH (1000h) |

Remark: the unrecoverable damage may occur when the product works on the conditions over the absolute maximum ratings. Long-time working on the absolute maximum ratings may cause the degradation on performance and reliability.

### Isolation parameters

| Parameter                          | Symbol | Unit | Value | Remark                          |
|------------------------------------|--------|------|-------|---------------------------------|
| RMS voltage for AC test 50Hz/1 min | Ud     | kV   | 4     |                                 |
| Impulse withstand voltage 1.2/50μs | Ūw     | kV   | 8     |                                 |
| Clearance distance (pri. -sec)     | dCl    | mm   | 12.9  | Shortest distance through air   |
| Creepage distance (pri. -sec)      | dCp    | mm   | 12.9  | Shortest path along device body |
| Case material                      |        |      | V0    | According to UL 94              |
| Comparative tracking index         | CTI    | V    | 600   |                                 |

## 2. Electrical parameters (STB-250LA/ZNR AND STB-250LA/ZR)

Condition: Vcc = 5.0 V, RL = 10 kΩ, T A = 25°C, unless specified.

| Parameters                                             | Symbol              | Unit                 | Min.                          | Typ.         | Max. | Remark                                                   |
|--------------------------------------------------------|---------------------|----------------------|-------------------------------|--------------|------|----------------------------------------------------------|
| Primary nominal rms current                            | I <sub>pn</sub>     | A                    |                               | 250          |      |                                                          |
| Primary current, measuring range                       | I <sub>pm</sub>     | A                    | -380                          |              | 380  | VCC=4.75V,@85°C                                          |
|                                                        |                     | A                    | -450                          |              | 450  | VCC=5V,@85°C                                             |
| Maximum measured peak overcurrent (transformer effect) | I <sub>p meas</sub> | A                    | -650                          |              | 650  | di/dt >= 50 A/μs,duration at 650 A is 400 μs             |
| Supply voltage                                         | Vcc                 | V                    | 4.75                          | 5            | 5.25 |                                                          |
| Consumption current                                    | Ic                  | mA                   | 15 + I <sub>p</sub> */NS*1000 |              |      | NS = 1500                                                |
| Reference voltage                                      | V <sub>ref</sub>    | V                    | 2.48                          | 2.5          | 2.52 |                                                          |
| Electrical offset voltage@25°C                         | V <sub>oe</sub>     | mV                   | -5                            |              | 5    | 100 % tested (V <sub>out</sub> – V <sub>ref</sub> )@ 0 A |
| Magnetic offset current                                | I <sub>om</sub>     | mA                   | -210                          |              | 210  | @5*I <sub>pn</sub>                                       |
| Full-scale voltage                                     | V <sub>fs</sub>     | V                    |                               | ± 0.675      |      | (V <sub>out</sub> – V <sub>ref</sub> )@ I <sub>pn</sub>  |
| Theoretical sensitivity                                | G <sub>th</sub>     | mV/A                 |                               | 2.7          |      | 0.675 V @ I <sub>pn</sub>                                |
| Sensitivity error                                      | G <sub>err</sub>    | % of I <sub>pn</sub> | -0.8                          |              | 0.8  |                                                          |
| Linearity error within I <sub>pn</sub>                 | ξ <sub>L</sub>      | % of I <sub>pn</sub> | -0.15                         |              | 0.15 | @25°C                                                    |
| Reaction time @ 10 % of I <sub>p</sub>                 | t <sub>ra</sub>     | μs                   |                               |              | 1    |                                                          |
| Step response time @ 90 % of I <sub>p</sub>            | t <sub>r</sub>      | μs                   |                               |              | 3    |                                                          |
| -3 dB band width                                       | BW                  | kHz                  | 200                           |              |      |                                                          |
| Noise<br>DC ~ 10 kHz<br>DC ~ 100 kHz                   | Vnoise              | mVpp                 |                               | 0.15<br>0.25 |      |                                                          |
| Accuracy @ 25°C                                        | X                   | % of I <sub>pn</sub> | -1                            |              | 1    |                                                          |
| Accuracy @ 85 °C                                       | X <sub>TRange</sub> | % of I <sub>pn</sub> | -1.4                          |              | 1.4  |                                                          |
| Vout Capacitive Load                                   | CL <sub>O</sub>     | pF                   | 0                             |              | 100  |                                                          |
| Vref Capacitive Load                                   | CL <sub>R</sub>     | pF                   | 0                             |              | 100  |                                                          |

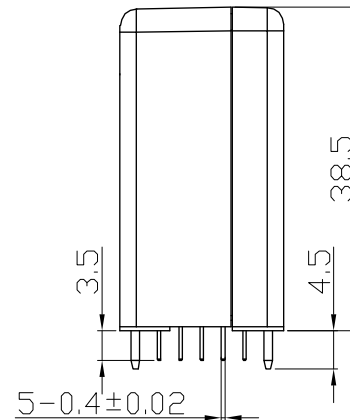
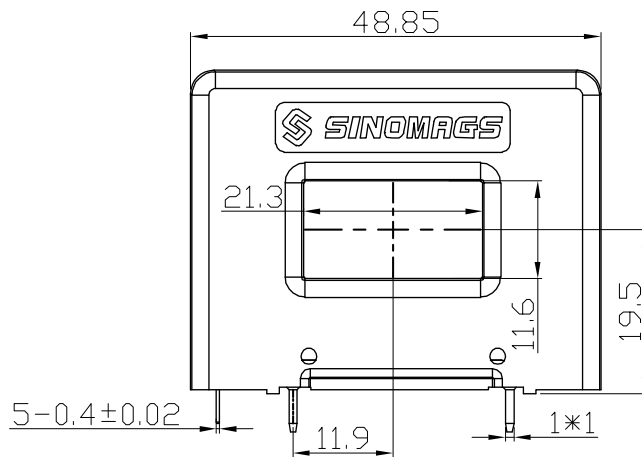
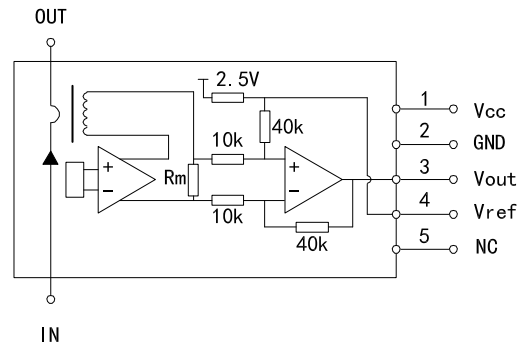
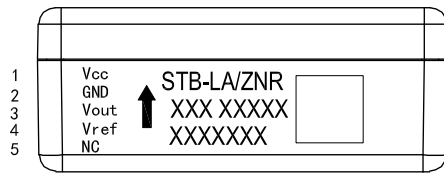
### 3. Electrical parameters (STB-250LA3/ZNR AND STB-250LA3/ZR)

Condition:  $V_{cc} = 5.0\text{ V}$ ,  $R_L = 10\text{ k}\Omega$ ,  $T_A = 25^\circ\text{C}$ , unless specified.

| Parameters                                             | Symbol               | Unit          | Min.                  | Typ.         | Max. | Remark                                                                        |
|--------------------------------------------------------|----------------------|---------------|-----------------------|--------------|------|-------------------------------------------------------------------------------|
| Primary nominal rms current                            | $I_{pn}$             | A             |                       | 250          |      |                                                                               |
| Primary current, measuring range                       | $I_{pm}$             | A             | -380                  |              | 380  | $V_{CC}=4.75\text{V}, @85^\circ\text{C}$                                      |
|                                                        |                      | A             | -470                  |              | 470  | $V_{CC}=5\text{V}, @85^\circ\text{C}$                                         |
| Maximum measured peak overcurrent (transformer effect) | $\hat{I}_{P_{meas}}$ | A             | -670                  |              | 670  | $di/dt \geq 50\text{ A}/\mu\text{s}$ , duration at 650 A is 400 $\mu\text{s}$ |
| Supply voltage                                         | $V_{cc}$             | V             | 4.75                  | 5            | 5.25 |                                                                               |
| Consumption current                                    | $I_c$                | mA            | $15 + I_{p*}/NS*1000$ |              |      | $NS = 1500$                                                                   |
| Reference voltage                                      | $V_{ref}$            | V             | 2.48                  | 2.5          | 2.52 |                                                                               |
| Electrical offset voltage@ $25^\circ\text{C}$          | $V_{oe}$             | mV            | -6                    |              | 6    | 100 % tested ( $V_{out} - V_{ref}$ )@ 0 A                                     |
| Magnetic offset current                                | $I_{om}$             | mA            | -210                  |              | 210  | @ $5*I_{pn}$                                                                  |
| Full-scale voltage                                     | $V_{fs}$             | V             |                       | $\pm 0.675$  |      | $(V_{out} - V_{ref})@ I_{pn}$                                                 |
| Theoretical sensitivity                                | $G_{th}$             | mV/A          |                       | 2.7          |      | 0.675 V @ $I_{pn}$                                                            |
| Sensitivity error                                      | $G_{err}$            | % of $I_{pn}$ | -0.8                  |              | 0.8  |                                                                               |
| Linearity error within $I_{pn}$                        | $\xi_L$              | % of $I_{pn}$ | -0.15                 |              | 0.15 | @ $25^\circ\text{C}$                                                          |
| Reaction time @ 10 % of $I_p$                          | $t_{ra}$             | $\mu\text{s}$ |                       |              | 1    |                                                                               |
| Step response time @ 90 % of $I_p$                     | $t_r$                | $\mu\text{s}$ |                       |              | 3    |                                                                               |
| -3 dB band width                                       | BW                   | kHz           | 200                   |              |      |                                                                               |
| Noise<br>DC ~ 10 kHz<br>DC ~ 100 kHz                   | $V_{noise}$          | mVpp          |                       | 0.15<br>0.25 |      |                                                                               |
| Accuracy @ $25^\circ\text{C}$                          | X                    | % of $I_{pn}$ | -1                    |              | 1    |                                                                               |
| Accuracy @ $85^\circ\text{C}$                          | $X_{TRange}$         | % of $I_{pn}$ | -1.4                  |              | 1.4  |                                                                               |
| Vout Capacitive Load                                   | $CL_O$               | pF            | 0                     |              | 100  |                                                                               |
| Vref Capacitive Load                                   | $CL_R$               | pF            | 0                     |              | 100  |                                                                               |



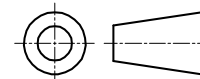
## 5. Dimensions: STB-xxxLA/ZNR



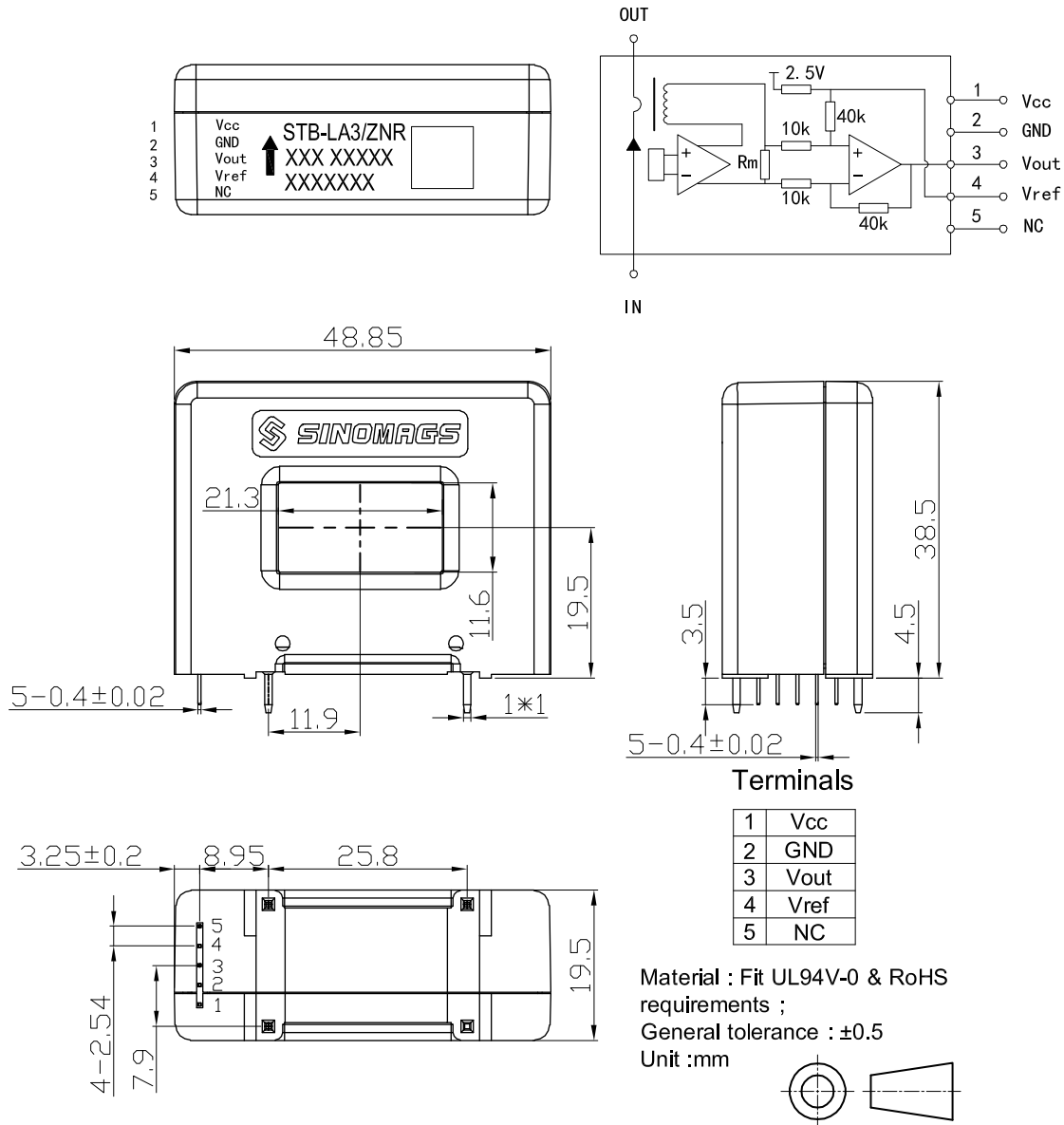
Terminals

|   |      |
|---|------|
| 1 | Vcc  |
| 2 | GND  |
| 3 | Vout |
| 4 | Vref |
| 5 | NC   |

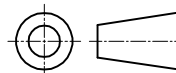
Material : Fit UL94V-0 & RoHS requirements ;  
General tolerance :  $\pm 0.5$   
Unit : mm

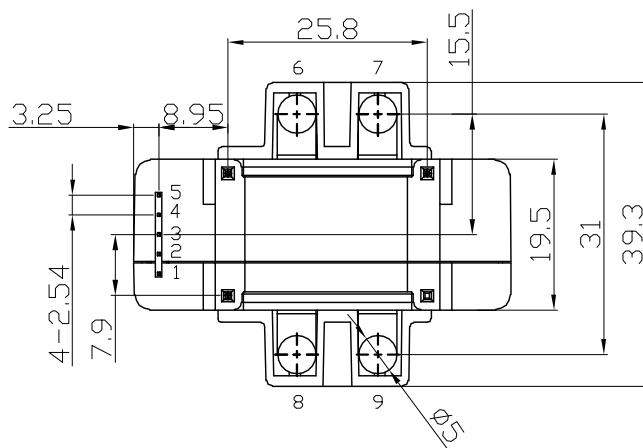
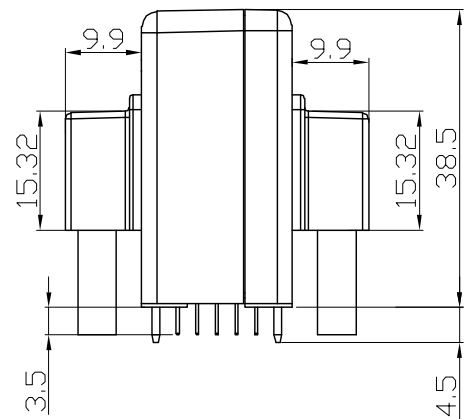
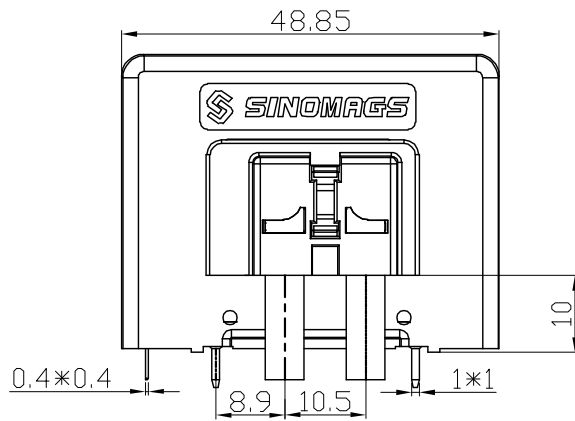
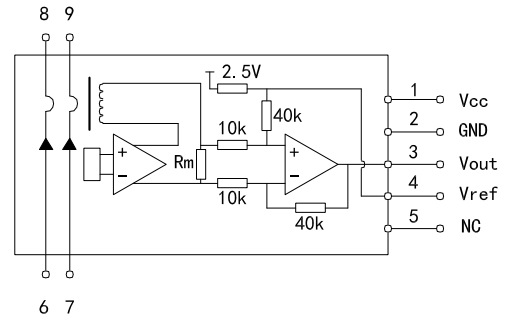
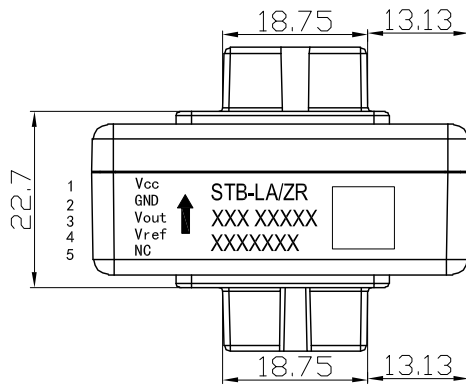


## 6. Dimensions: STB-xxxLA3/ZNR





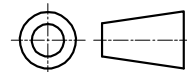




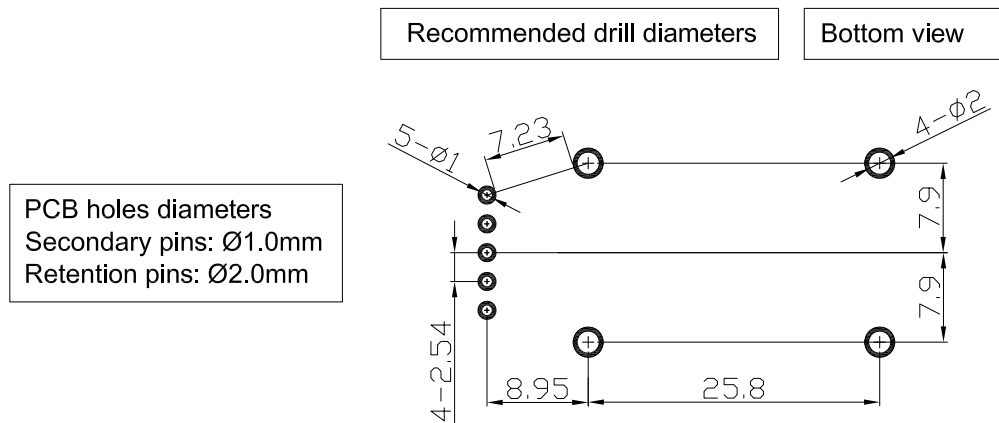
### Terminals

|   |      |   |     |
|---|------|---|-----|
| 1 | Vcc  | 6 | Ip+ |
| 2 | GND  | 7 | Ip+ |
| 3 | Vout | 8 | Ip- |
| 4 | Vref | 9 | Ip- |
| 5 | NC   |   |     |

Material : Fit UL94V-0 & RoHS requirements ;  
General tolerance :  $\pm 0.5$   
Unit :mm



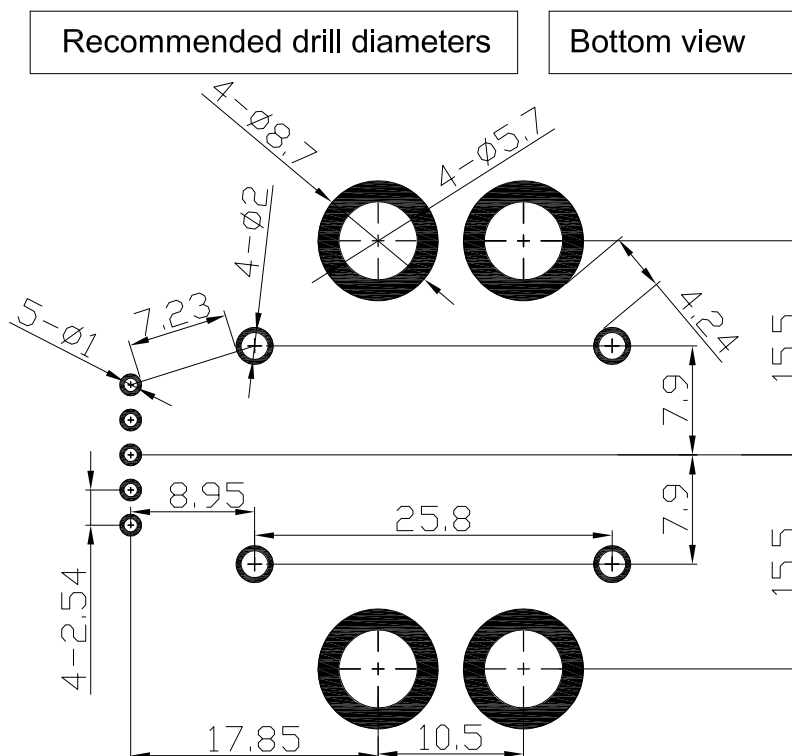
## 9. PCB footprint (STB-xxxLA/ZNR And STB-xxxLA3/ZNR )



### Assembly on PCB

- Recommended PCB hole diameter: 1 mm for secondary pins, 2 mm for retention pin.
- Maximum PCB thickness: 2.4 mm (can be customized per request).
- Wave soldering profile: maximum  $260^{\circ}\text{C}$  for 10 seconds.

## 10. PCB footprint (STB-xxxLA/ZR And STB-xxxLA3/ZR)



### Assembly on PCB

- Recommended PCB hole diameter: 1 mm for secondary pins, 2 mm for retention pin.
- Maximum PCB thickness: 2.4 mm (can be customized per request).
- Wave soldering profile: maximum  $265^{\circ}\text{C}$  for 10 seconds.