

## BRCS01V / UL2231-2 (CCID20)

*Residual Current Sensor for Charging Equipment of Electric Vehicles*

- UL 2231-2 (CCID20)
- IEC 62955 / IEC 62752

The BRCS01V-U5/U6 is an AC/DC residual current sensor with two separate fault signal outputs – one Pin conforming to UL2231-2 (CCID20) and the other Pin conforming to IEC 62955 or IEC 62752. It can be used for built-in residual current protection system at AC charging stations.



- Digital outputs of fault detection conforming to UL2231-2 (CCID20) and IEC 62955 / IEC 62752
- Cost-effective solution of residual current detection for mode-2/3 EVSE
- Fast response time facilitating a broad selection of switching devices
- Accurate measurement and optimization against nuisance tripping

## Technical Specification

| #   | Technical Specification                                              | BRCS01V-U5              | BRCS01V-U6              |
|-----|----------------------------------------------------------------------|-------------------------|-------------------------|
| 101 | Rated current in monitoring circuit (1phase/3phase)                  | 80A / 40A               | 80A / 40A               |
| 102 | Rated frequency in monitoring circuit                                | 60Hz                    | 60Hz                    |
| 103 | Rated impulse withstand voltage in monitoring circuit                | 6kV                     | 6kV                     |
| 104 | Over-voltage category in monitoring circuit                          | III                     | III                     |
| 201 | Rated operating voltage in control circuit, Vcc                      | 5VDC±3%                 | 5VDC±3%                 |
| 202 | Power consumption                                                    | <500mW                  | <500mW                  |
| 203 | Pin 1 – Vcc for 5V                                                   | +5VDC                   | +5VDC                   |
| 204 | Pin 2 – Trip signal: X20-UL2231 (CCID20)                             | Digital output          | Digital output          |
| 205 | Pin 3 – GND                                                          | GND                     | GND                     |
| 206 | Pin 4 – Trip signal: X6-IEC62955 (RDC-MD) or X30-IEC62752 (IC-CPD)   | Digital output (RDC-MD) | Digital output (IC-CPD) |
| 207 | Pin 5 – Test signal                                                  | Digital input           | Digital input           |
| 301 | Rated DC residual operating current $I_{\Delta dc}$ (IEC 62955)      | 6mA                     | 6mA                     |
| 302 | Rated DC residual non-operating current $I_{\Delta ndc}$ (IEC 62955) | 3mA                     | 3mA                     |
| 303 | Rated AC residual operating current $I_{\Delta n}$ (UL2231-2)        | 20mA                    | 20mA                    |
| 304 | Rated AC residual non-operating current $I_{\Delta nc}$ (UL2231-2)   | 15mA                    | 15mA                    |
| 305 | Rated AC residual operating current $I_{\Delta n}$ (IEC 62752)       | -                       | 30mA                    |
| 306 | Rated AC residual non-operating current $I_{\Delta nc}$ (IEC 62752)  | -                       | 15mA                    |
| 307 | Electrical endurance                                                 | 20,000                  | 20,000                  |
| 308 | Rated operating temperature                                          | -40~85 °C               | -40~85 °C               |
| 309 | Pollution degree                                                     | 2                       | 2                       |

## Residual Current Detection Characteristics

### PIN 4 (X6/X30 Output) - IEC 62955/IEC62752

#### Operating Current

| #   | Operating Current          | PIN 4 (X6)<br>@BRCS01V-U5 | PIN 4(X30)<br>@BRCS01V-U6 |
|-----|----------------------------|---------------------------|---------------------------|
| 401 | Smooth DC                  | 4.0~6.0 mA                | 4.0~6.0 mA                |
| 402 | DC rectified from 2 phases | 4.0~7.0 mA                | 4.0~7.0 mA                |
| 403 | DC rectified from 3 phases | 4.0~6.2 mA                | 4.0~6.2 mA                |
| 404 | Sinewave AC                | -                         | 22.0~28.0 mA              |
| 405 | A0 pulsating DC            | -                         | 10.5~42.0 mA              |
| 406 | A90 pulsating DC           | -                         | 7.5~42.0 mA               |
| 407 | A135 pulsating DC          | -                         | 3.3~42.0 mA               |

#### Operating Time

| #   | Response time                    | PIN 4 (X6)<br>@BRCS01V-U5 | PIN 4 (X30)<br>@BRCS01V-U6 |
|-----|----------------------------------|---------------------------|----------------------------|
| 501 | Smooth DC 6mA                    | ≤ 500 ms                  | ≤ 500 ms                   |
| 502 | Smooth DC 60mA                   | ≤ 200 ms                  | ≤ 200 ms                   |
| 503 | Smooth DC 200mA                  | ≤ 70 ms                   | ≤ 70 ms                    |
| 504 | Smooth DC 300mA                  | -                         | ≤ 20 ms                    |
| 505 | DC rectified from 2 phases 60mA  | ≤ 200 ms                  | ≤ 200 ms                   |
| 506 | DC rectified from 2 phases 200mA | ≤ 70 ms                   | ≤ 70 ms                    |
| 507 | DC rectified from 2 phases 300mA | -                         | ≤ 20 ms                    |
| 508 | DC rectified from 3 phases 60mA  | ≤ 200 ms                  | ≤ 200 ms                   |
| 509 | DC rectified from 3 phases 200mA | ≤ 70 ms                   | ≤ 70 ms                    |
| 510 | DC rectified from 3 phases 300mA | -                         | ≤ 20 ms                    |
| 511 | AC 30mA                          | > 10000 ms                | ≤ 80 ms                    |
| 512 | AC 60mA                          | > 300 ms                  | ≤ 60 ms                    |
| 513 | AC 150mA                         | > 80 ms                   | ≤ 20 ms                    |
| 514 | AC 5A                            | > 80 ms                   | ≤ 20 ms                    |

**PIN 2 (X20 Output) - UL2231-2(CCID-20)**

**Operating Current**

| #   | Operating Current | PIN 2 (X20)<br>@BRCS01V-U5/U6 |
|-----|-------------------|-------------------------------|
| 601 | 60Hz sinewave AC  | 15.0~20.0 mA                  |
| 602 | 150Hz sinewave AC | 15.0~34.5 mA                  |
| 603 | 400Hz sinewave AC | 15.0~69.6 mA                  |
| 604 | Smooth DC         | 20.0~56.0 mA                  |

**Operating Time**

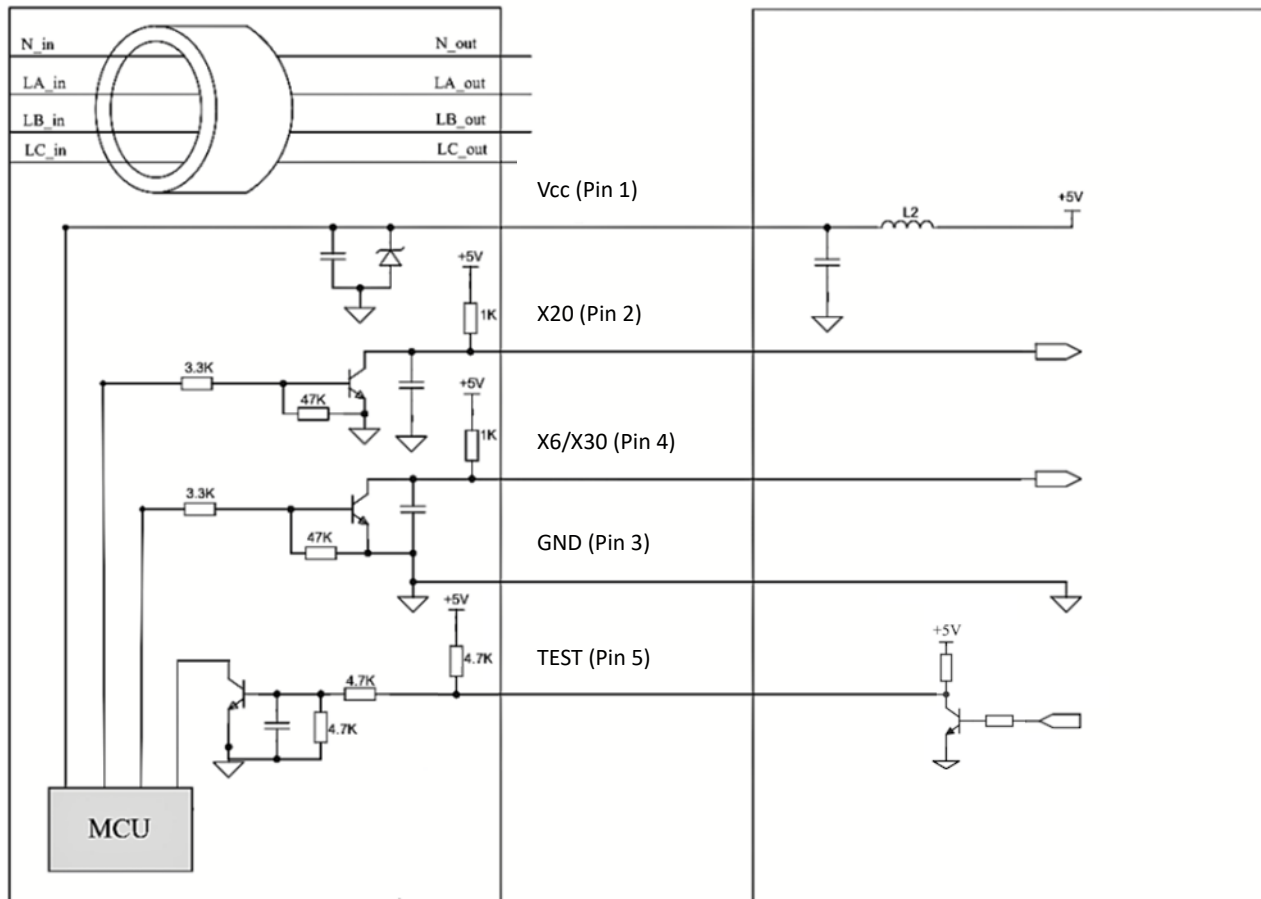
| #   | Response time                    | PIN 2 (X20)<br>@BRCS01V-U5/U6 |
|-----|----------------------------------|-------------------------------|
| 701 | 20mA AC residual current (60Hz)  | ≤ 500 ms                      |
| 702 | 100mA AC residual current (60Hz) | ≤ 20 ms                       |
| 703 | 264mA AC residual current (60Hz) | ≤ 15 ms                       |
| 704 | 56mA smooth DC residual current  | ≤ 40 ms                       |
| 705 | 100mA smooth DC residual current | ≤ 20 ms                       |

## Application Notes

### Typical application diagram

BRCS01V version

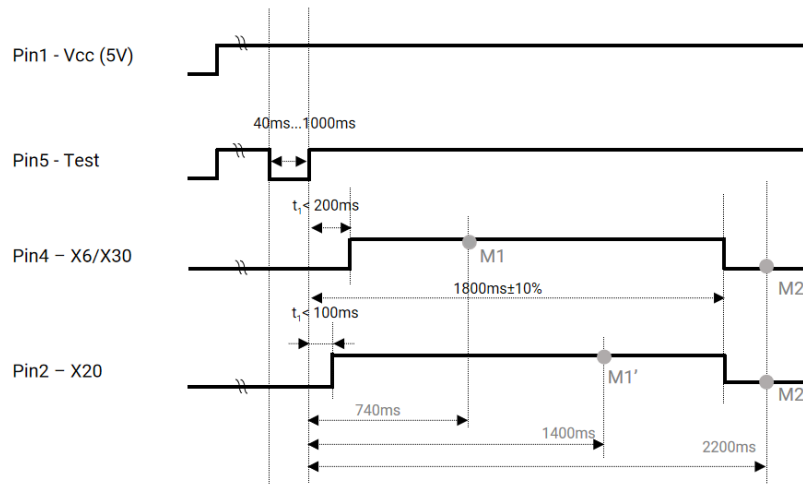
EV charging controller



### Additional information

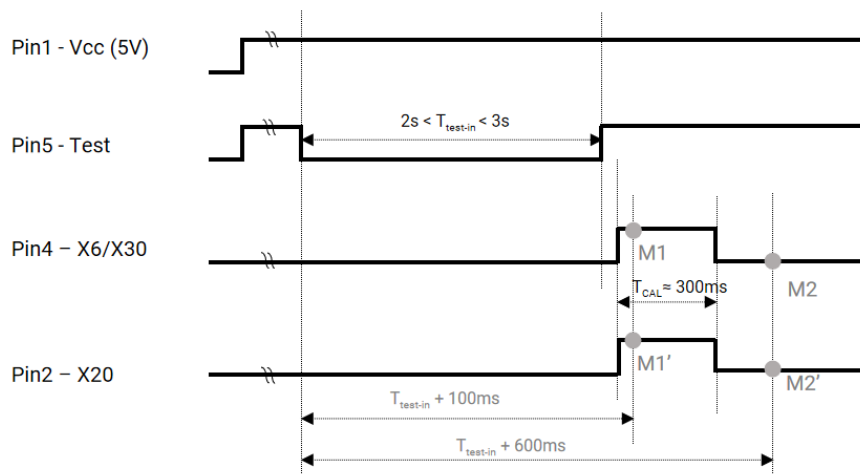
- **Vcc Pin** (Power supply pin): The power supply voltage range to the sensor is 4.85 - 5.15 VDC, and the power ripple is not higher than 150mV. Ferrite beads and filter capacitors are suggested to be placed close to the Vcc pin. In addition, a LDO - such as LP2985A-50DBV- is strongly recommended to be used at the charging controller side.
- **Trip Pins** (Fault signal output pin): When residual current in the circuit exceeds the threshold, the output level changes from low to high. Suggest adding ferrite beads and filter capacitors close to this pin. A direct connection of Pin 2/4 to switching devices- such as relays or contactors- is NOT allowed. The trip signal of Pin 2/4 is suggested to be monitored by the charging controller MCU.
- **TEST Pin** (Self-test input pin): Before starting every charging, this pin is used to perform a simulated test to verify whether the sensor functions correctly.

### Self-test time chart



A self-test excluding offset calibration is activated if Pin 5 - Test is connected to GND for a period of 40ms to 130ms; A self-test including offset calibration is activated if Pin 5 - Test is connected to GND for a period of 150ms to 1000ms.  $t_1$  is the response time for internally generated test current.

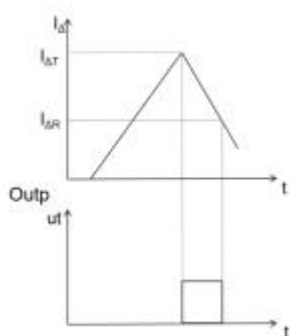
### Offset calibration time chart



An explicit offset calibration excluding self-test cycle is activated if Pin 5 - Test is connected to GND for a period of 2s to 3s. An offset calibration can be activated at regular intervals (such as start-up) or after the occur of certain critical events (such as short circuit).

**Attention:** During the offset calibration, NO leakage current or any other current may flow through the device and the relays/contactors must be open. Also, the power supply voltage at Pin 1 Vcc must be stay at 5VDC  $\pm$  3%.

### Figures



If the trip-level  $I_{\Delta T}$  is accomplished the output will change their state from low-level to high level. Depending on the existence of the residual current  $I_{\Delta}$ , the output will remain in this state until  $I_{\Delta}$  falls below the threshold  $I_{\Delta R}$

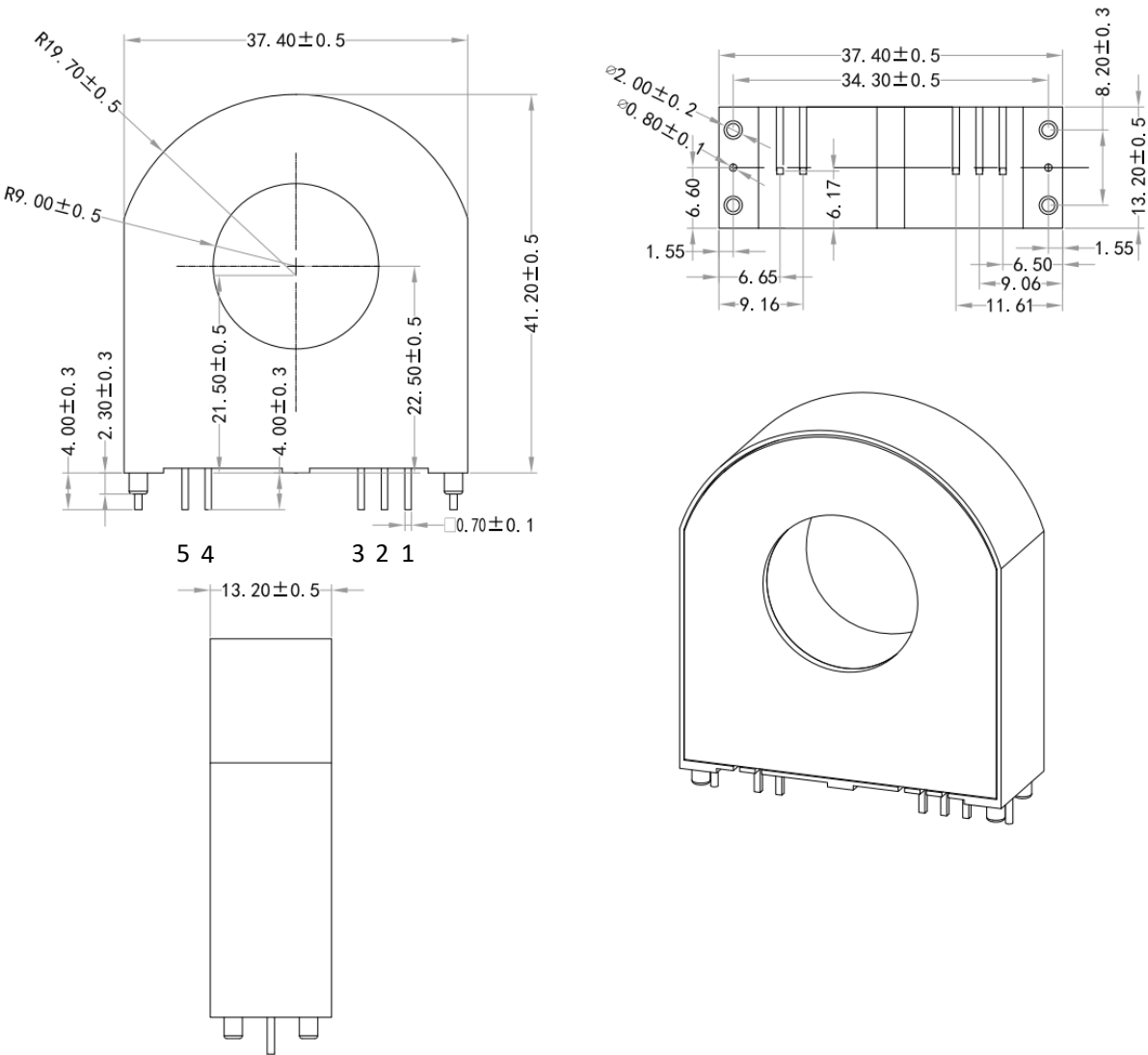
- X20 Pin (CCID20) : Typical values of  $I_{\Delta T}$  DC 26mA & AC 17.5mA; Typical value of  $I_{\Delta R}$  is 75%.

- X30 Pin (IEC 62752) : Typical values of  $I_{\Delta T}$  DC 5mA & AC 24mA; Typical value of  $I_{\Delta R}$  is 75%.

- X6 Pin (IEC 62955) : Typical values of  $I_{\Delta T}$  DC 5mA; Typical value of  $I_{\Delta R}$  is 75%.

Mechanical outline

BRCS01V-U5/U6-S:



|               | Pin 1 | Pin 2                             | Pin 3 | Pin 4                        | Pin 5 |
|---------------|-------|-----------------------------------|-------|------------------------------|-------|
| BRCS01V-U5-S1 | 5V DC | AC & DC fault<br>(UL2231(CCID20)) | GND   | DC fault<br>(IEC 62955)      | Test  |
| BRCS01V-U6-S1 | 5V DC | AC & DC fault<br>(UL2231(CCID20)) | GND   | AC & DC fault<br>(IEC 62752) | Test  |

## Ordering information

| # | Order Number  | Description                                                           |
|---|---------------|-----------------------------------------------------------------------|
| 1 | BRCS01V-U5-S1 | BRCS01V Residual Current Sensor, 5V DC<br>UL2231-2(CCID20) & IEC62955 |
| 2 | BRCS01V-U6-S1 | BRCS01V Residual Current Sensor, 5V DC<br>UL2231-2(CCID20) & IEC62752 |

## Additional Notes

- Do NOT allow strong static electricity near the sensor, because static electricity can cause damage to the ICs inside the sensor. Take static electricity precautions when handling.
- Do NOT exceed 260°C for 10 seconds when soldering the sensors of PCB-mounting versions. This is the maximum heat resistance grade of these sensors.
- Do NOT drop the sensor or apply any other mechanical stress to the sensor, as such stresses may change performance characteristics.
- Please place the sensor with an appropriate distance from components that can generate high magnetic fields, such as relays or contactors, to ensure accurate residual current detection.



The sensor is susceptible to be damaged from an ESD event and the personnel should be grounded when handling it.

**Shanghai Bituo Electric Co.,Ltd.**

Add.: 5F, Building 24, No. 518 Xinzhuang Road, Songjiang District, Shanghai 201600, China

Tel: +86 (21) 5780 8599

Email: [info@bituo-technik.com](mailto:info@bituo-technik.com)

Website: [www.bituo-technik.com](http://www.bituo-technik.com)

© Copyright 2025 **BITUOTECHNIK**. All rights reserved.

Specifications and illustrations subject to change without notice.