# Adjustable Current Switch Device

## Features:

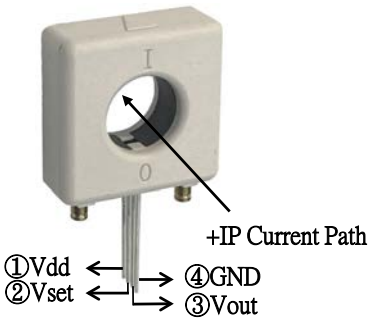
- Current switch, current measurement and on-site calibration
- Response time 500ns
- High Resolution ±0.25A
- Wide sensing current range 0~60A
- Output "High" when $V_{IP} > V_{set}$
- Output "Low" when $V_{IP} < V_{set}$
- Diameter 9.0 mm conductor through hole
- Wide operating voltage range 3.0~12V
- Almost zero hysteresis
- 23K Hz Bandwidth
- Isolation voltage 4000V
- Diameter 9.0 mm conductor through hole

## Functional Description :

The Winson WCSA760 is a current switch designed for current switching and current measuring. The current switching can be adjusted through providing reference voltage to the $V_{set}$ Pin. The output voltage ($V_{out}$) turns to high voltage level when the internal voltage ($V_{IP}$) is greater than the reference voltage ($V_{set}$). In contrast, the output turns to the low level. Typical applications include short circuit detection, over-current fault detection, and etc. For the current measuring, it provides a precise solution for both DC and AC current sensing in industrial, and users can also adjust the reference voltage value of current switch mode on-site by measuring current mode.

The WCSA760 consists of a precise, low-temperature drift linear hall sensor IC with temperature compensation circuit and a diameter 9.0 mm through hole. Any current flowing through this hole will generate a magnetic field which is sensed by the integrated Hall IC and converted into a proportional output voltage.

The terminals of the conductive path are electrically isolated from the sensor leads. This allows the WCSA760 current sensor to be used in applications requiring electrical isolation without the usage of opto-isolators or other costly isolation techniques.




## Absolute Maximum Range

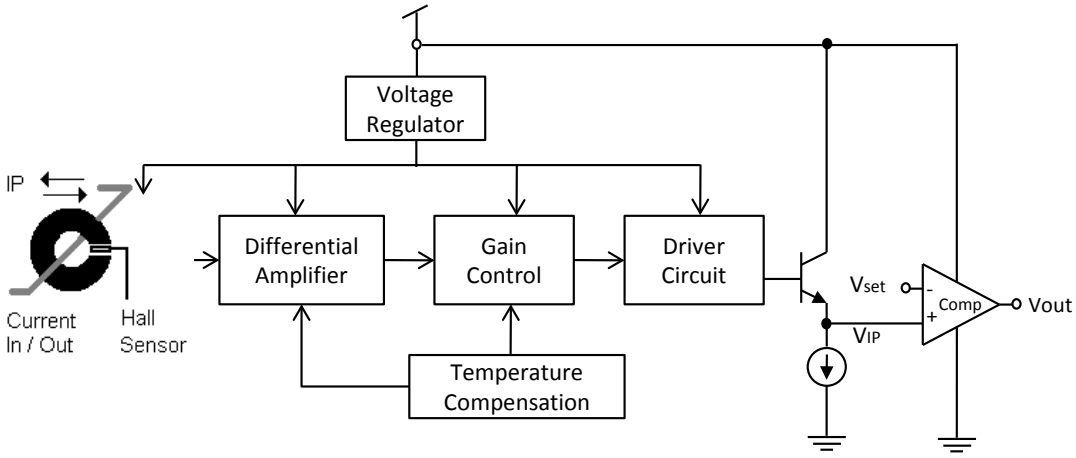
Supply Voltage, Vdd ---------- **14V**
Pass Through Wire Diameter ---------- **9mm**
Output Current Sink---------- **50uA**
Output Current Source---------- **1.5mA**
Basic Isolation Voltage ---------- **4000V**
Operating Temperature Range, Ta ----------
---------- **-20ºC to +125ºC**
Storage Temperature Range, Ts ----------
---------- **-65ºC to +150ºC**
Power Dissipation, Pd ----------**1W**

| Number | Name | Description |
|---|---|---|
| 1 | Vdd | Power supply terminal |
| 2 | Vset | Setup input terminal |
| 3 | Vout | Output voltage terminal |
| 4 | GND | Signal ground terminal |

**( Vdd = 5V)**

| Function | Current Range | Resolution | Sensitivity |
|---|---|---|---|
| Switch | DC:±0~60A | ±0.25 A | |
| Linear | DC:±0~60A | | 32 mV/A |
| | AC:rms 40A | | |

## Function Block:




**Functional Block Diagram**

Winson reserves the right to make changes to improve reliability or manufacturability.

## Electrical Characteristics: (T=+25˚C, $V_{dd}$=5.0V )

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Supply Voltage | Vdd | — | 3.0 | — | 12 | V |
| Supply Current | Isupply | IP =0 A | — | 3.5 | 6.0 | mA |
| Conductor Through Hole | — | — | — | 9.0 | — | mm² |

## Switching Characteristics: (T=+25˚C, $V_{dd}$=5.0V )

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Output Voltage | $V_H$ | Full Range | Vdd-0.2 | — | — | V |
| | $V_L$ | | — | — | 0.1 | |
| Resolution | $IP_{Resolution}$ | — | — | ±0.25 | — | A |
| Adjustable Current Range | PR | DC Mode | — | ±60 | — | A |
| Response Time (low to high level) | $T_{RP}$ | With 2.5A overdrive $C_{Load}$ = 15pF (1) (2) (3) | — | 0.5 | — | uS |
| | | With 2.5A overdrive $C_{Load}$ = 0.01uF (1) (2) (3) | — | 60 | — | |
| Response Time (high to low level) | | With 2.5A overdrive $C_{Load}$ = 15pF (1) (2) (3) | — | 4 | — | |
| | | With 2.5A overdrive $C_{Load}$ = 0.01uF (1) (2) (3) | — | 900 | — | |
| Rising Time | $T_{RISE}$ | With 2.5A overdrive $C_{Load}$ = 15pF (1) (2) (3) | — | 0.5 | — | uS |
| Fall Time | $T_{FALL}$ | With 2.5A overdrive $C_{Load}$ = 15pF (1) (2) (3) | — | 4 | — | uS |

1. $C_{Load}$ includes probe and jig capacitance.

2. The response time is specified for a 5A(150mV) input step with 2.5A(75mV) overdrive.

3. Response time can refer to “characteristic Diagrams” Fig.1~3.

## Linear Characteristics: (T=+25˚C, $V_{dd}$=5.0V, $V_{set}$ pin and $V_{out}$ pin short )

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Zero Current Vout | VIP | IP =0 A | 2.35 | 2.5 | 2.65 | V |
| Sensitivity | Sens | IP= +-10 A | 27.2 | 32 | 36.8 | mV/A |
| Bandwidth | BW | — | — | 23 | — | kHz |
| Measurable Current Range | MR | Vdd=5V (DC Mode) | — | ±60 | — | A |
| | | Vdd=5V (AC RMS ) | — | 40 | — | |
| Temperature Drift | △Vout | Ip =0 A | — | ±0.5 | — | mV/℃ |
| Output Noise | $V_{Np-p(0.01F)}$ | IP =0 A, $C_{Load}$ = 0.01uF | — | 12 | — | mV |
| | $V_{Np-p(0.1uF)}$ | IP =0 A, $C_{Load}$ = 0.1uF | — | 7 | — | |

1. All output-voltage measurements are made with a voltmeter having an input impedance which is at least 100kΩ

2. Connect ‘capacitive load’ (0.01uF) in parallel at output pin.

Do not apply any ‘resistor load’ on output pin, it will degrade IC’s performance.

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## Characteristic Diagrams:

### (1)Switch

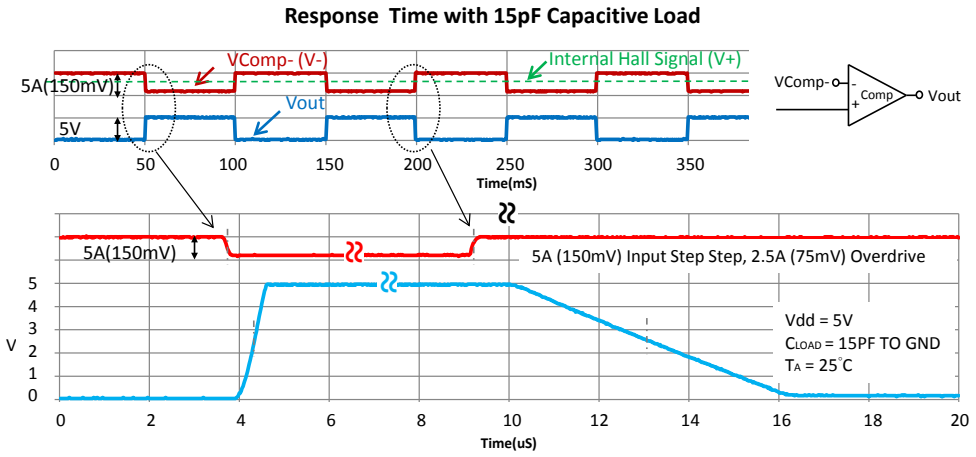


**Fig. 1**

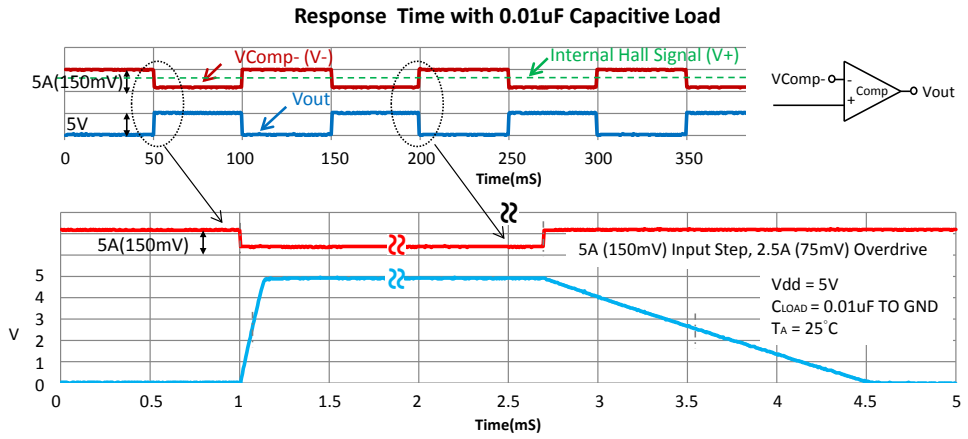


**Fig. 2**

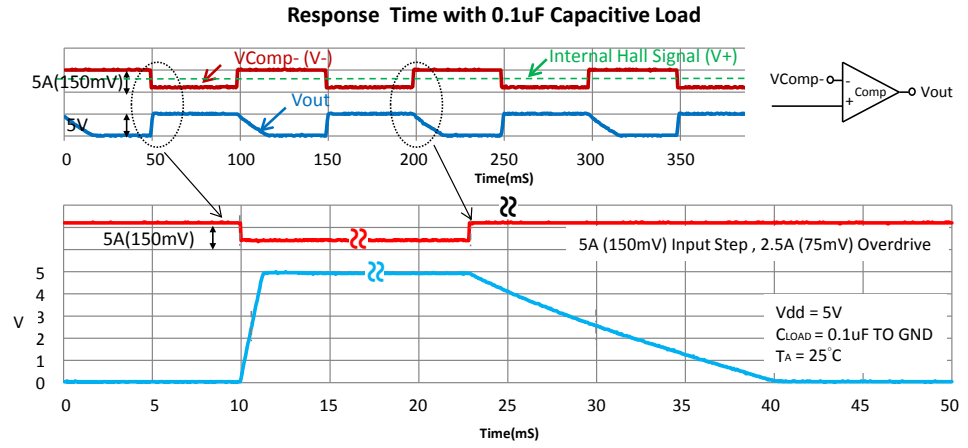


**Fig. 3**

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## (2)Linear

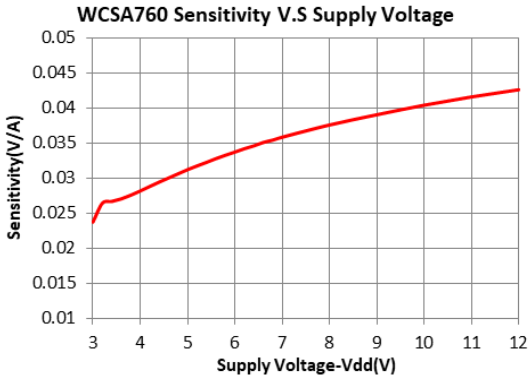


**Fig. 4**

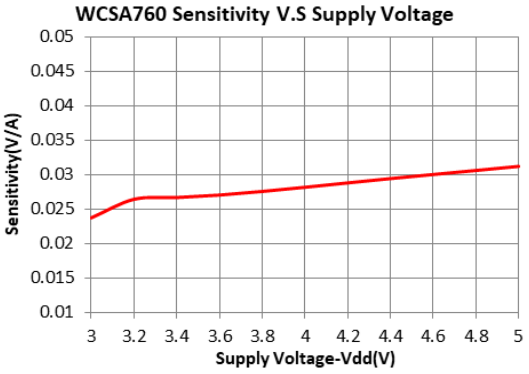


**Fig. 5**

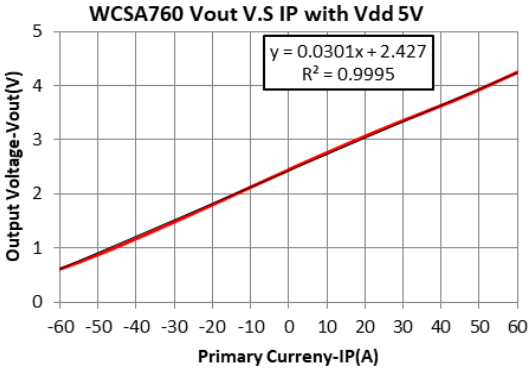


**Fig. 6**

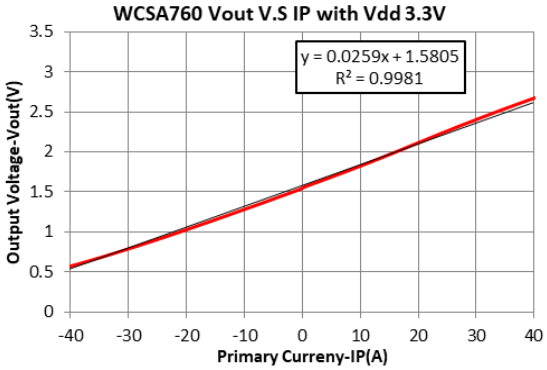


**Fig. 7**

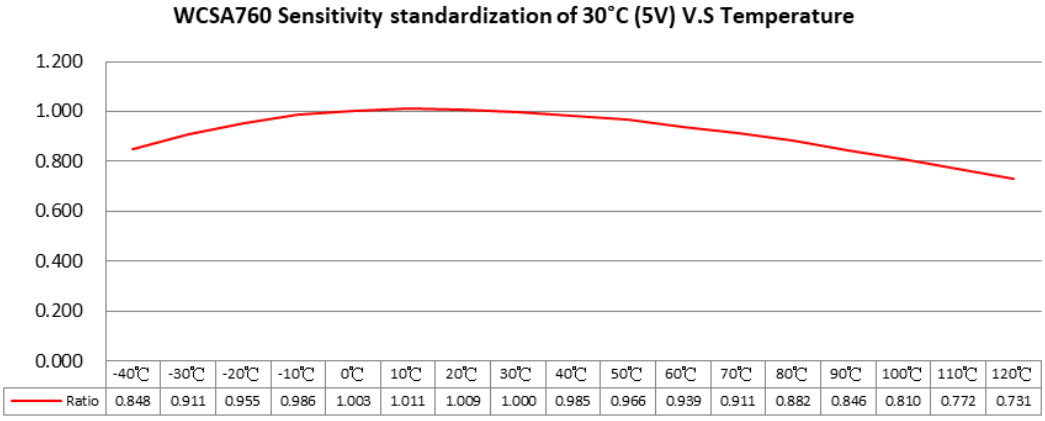


**Fig. 8**

Winson reserves the right to make changes to improve reliability or manufacturability.

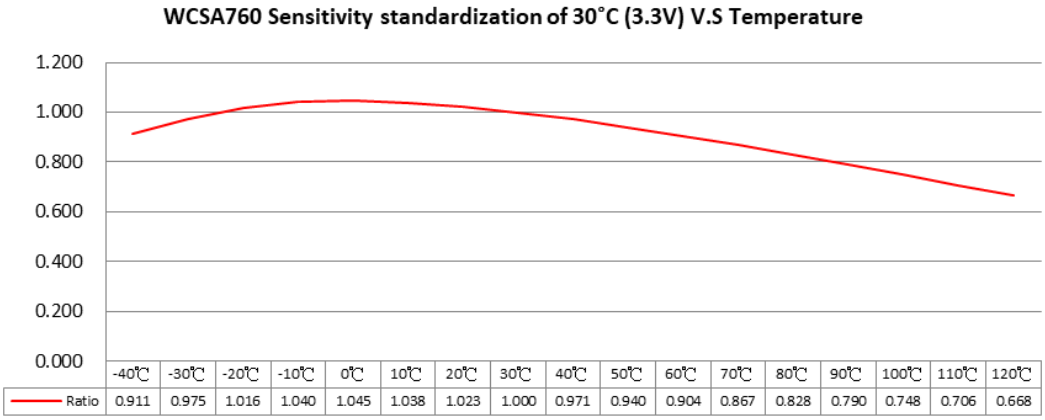


**Fig. 9**

## Package Information:

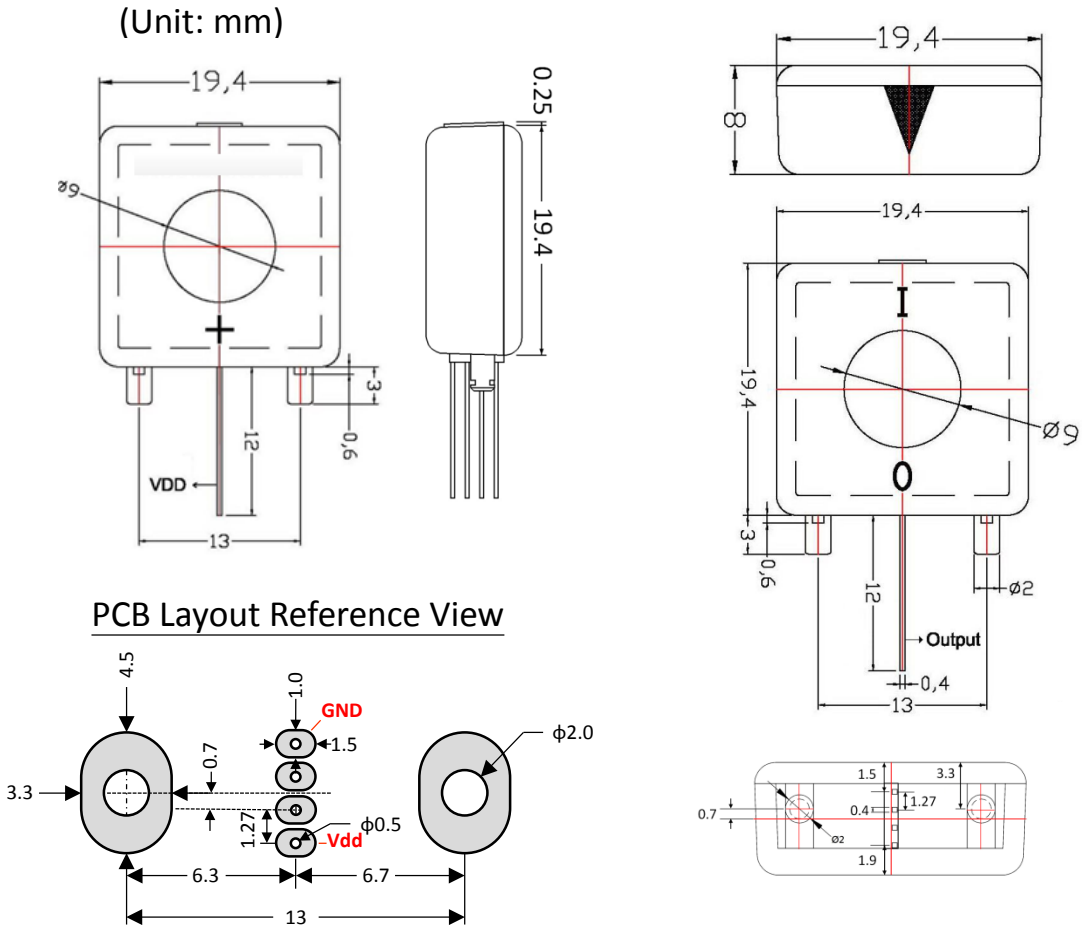


**Fig. 8**

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Application Circuit and Note:

(1)Current Switching - Direct Setting Method:

**1.Supply Voltage :** apply voltage $V_{dd}$。

**2.Measure the Overcurrent Value :** $V_{set}$ pin and $V_{out}$ pin are short-circuited, and output pin does not need to be connected to any load which is as shown in Fig.11. Users can set the IP overcurrent value by putting the target current which is flowing through this hole. Then, measure the output voltage ($V_{out}$) directly by a multimeter under DC mode and records this voltage.

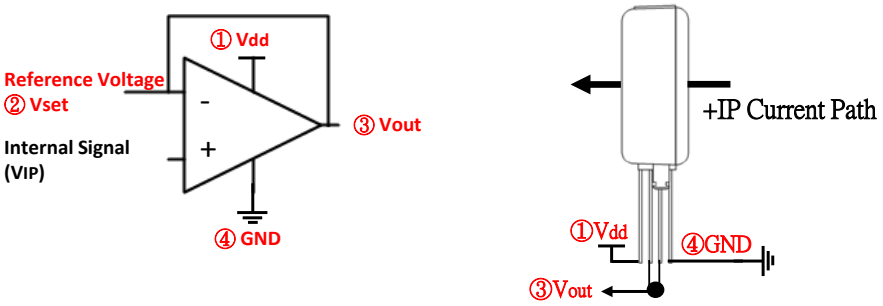


**Fig. 11**

**3.Set the Overcurrent Value :** $V_{set}$ pin and $V_{out}$ pin are open-circuited, which is shown in Fig.12. The $V_{set}$ pin input the above-mentioned measured voltage value. The $V_{IP}$ is an internal Hall sensing signal, which converts into a proportional voltage according to the IP current.

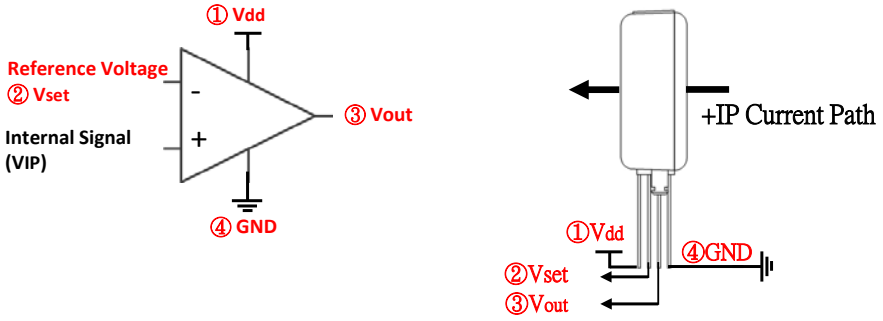


**Fig. 12**

**4.Output** : the output voltage levels will change according to the $V_{set}$ voltage.

Output "High" when $V_{IP} > V_{set}$

Output "Low" when $V_{IP} < V_{set}$

(2)Current Switching - Formula Solution Method:

**1. The Zero Current Value**

**1.1Measure the Zero Current Value $V_{0A}$ :** $V_{set}$ pin and $V_{out}$ pin are short-circuited, and output pin does not need to be connected to any load which is as shown in Fig.11. The output voltage ($V_{out}$) is directly measured by a multimeter under DC mode.

**1.2The Measuring Current ⇆ Voltage $V_{0A}$**: measure the output's voltage when no current pass through under the supply voltage 5V and record this voltage.

$V_{IP} = V_{0A} \fallingdotseq 2.5V$

**2. The Overcurrent Value**

**2.1Set the Reference Voltage $V_{set}$ :** $V_{set}$ pin and $V_{out}$ pin are open-circuited, which is as shown in Fig.12. The $V_{set}$ pin input voltage range is 0~$V_{dd}$.

**3.2The Overcurrent Current Value ⇆ Voltage $V_{set}$**:, WCSA760 sensitivity is about **32mV/A** under the supply voltage 5V.

(ΔV = Current ∗ Sensitivity)

Example 1: the overcurrent value is 10A

$V_{set} = V_{10A} = (V_{0A}+\Delta V) = 2.5+(10*0.032) \fallingdotseq 2.82V$

Example 2: the overcurrent value is -10A

$V_{set} = V_{-10A} = (V_{0A}-\Delta V) = 2.5-(10*0.032) \fallingdotseq 2.18V$

Example 3: the overcurrent value is 20A

$V_{set} = V_{20A} = (V_{0A}+\Delta V) = 2.5+(20*0.032) \fallingdotseq 3.14V$

**3. Output** : the output voltage levels will change according to the $V_{set}$ voltage.

(3)Current Measuring

1. **Supply Voltage :**apply voltage $V_{dd}$。
2. **Measure the Zero Current Output Voltage $V_{0A}$ (Internal Signal, $V_{IP}$)**: $V_{set}$ pin and $V_{out}$ pin are short-circuited, and output pin needs to be connected capacitive load to GND, recommend value is 0.01uF. As shown in Fig.13. (Internal circuit configuration of this device is used a comparator, the phase compensation capacitance for oscillation prevention is not included in the comparator. So users need to connect capacitive load in parallel at output terminal if using in a negative feedback configuration.)

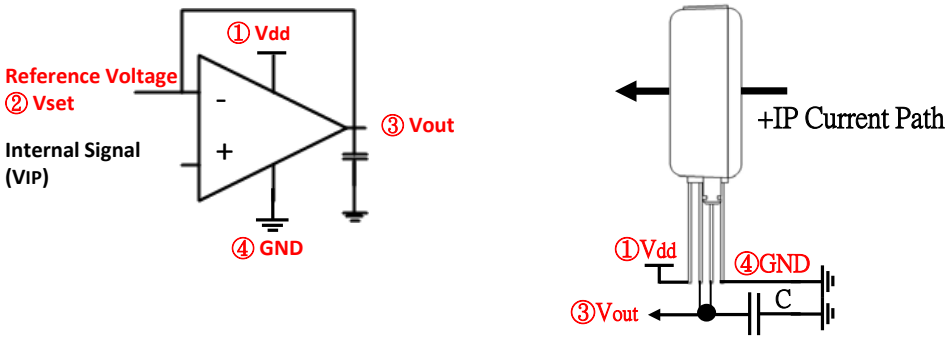


**Fig. 13**

3. **Calibration :** please refer to Winson Website-> Current Sensing Element-> WCS Series Current Sensing Element Instructions: http://www.winson.com.tw/products_c_current_sensor.html