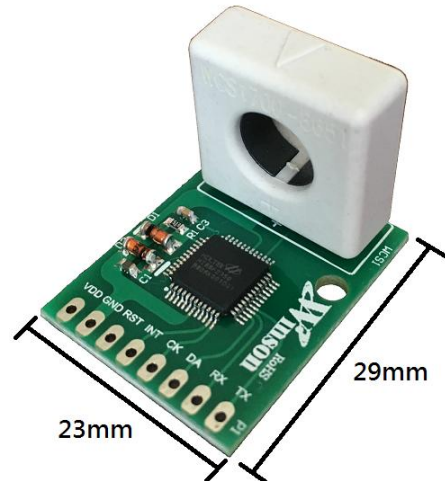


AC / DC Sensing Current Module with Digital Data output**Feature:**

- Accuracy optimization: ultra-high low-current sensitivity with 1% high-current linearity.
- Provides versatile measurement ranges with excellent resolution.
- Diameter 9.0mm conductor through hole
- UART, Baud Rate : 9600 bps, Parity bit : None , Data bit : 8 , Stop bit : 1
- Supply voltage calibration
- Temperature calibration
- Isolation voltage 4KV
- Application note:

<http://www.winson.com.tw/Product/83>

**General Description:**

The Winson Semiconductor WCM1X00 Series delivers high-efficiency, cost-effective AC/DC sensing for industrial and smart power systems. Integrating a high-precision ADC with a 9.0mm through-hole design, it enables non-intrusive installation and 4KV isolation protection without circuit modification.

Its technical core features True RMS (50/60Hz) and DC sensing, with voltage and temperature compensation for stable output. High-precision digital calibration algorithm ensures milliamp-level error at small currents and 1% high-linearity accuracy for large currents.

ABSOLUTE MAXIMUM RATING

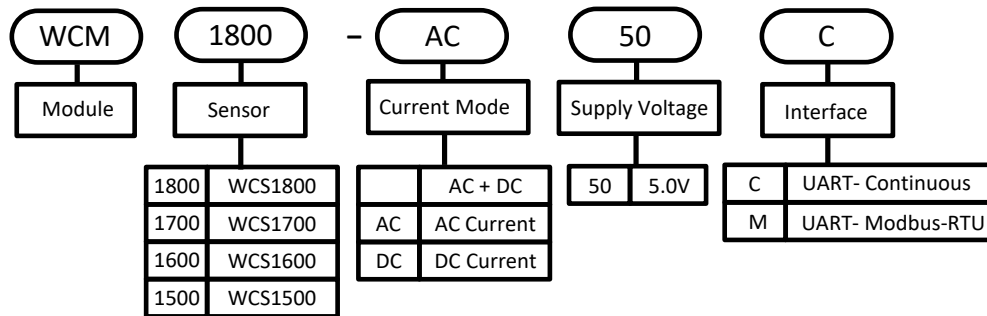


Supply Voltage, V_{DD} ----- 6V
 Pass Through Wire Diameter ----- 9.0mm
 Reverse Protection Voltage, V_R ----- -0.3V
 Basic Isolation Voltage ----- 4000V
 Operating Temperature Range, T_A -----
 ----- -40°C to +85°C
 Storage Temperature Range, T_S -----
 ----- -50°C to +125°C

Note:

1.VDD 2.GND 3.RST 4.INT 5.CK 6.DA 7.RX 8.TX **1. Stresses above those listed may cause permanent damage to the devices**

Selection Guide:



1. The WCM1500 supports “Floating Output” format only. Please refer to the application notes - output format.

2. AC/DC current mode supports continuous transmission only (AC50C, DC50C).

• Measuring Range & Resolution

Model	AC Range	DC Range	Resolution
WCM1800	17A	±25A	18mA
WCM1700	35A	±50A	37mA
WCM1600	50A	±75A	54mA
WCM1500	100A	±150A	110mA

• Communication Format

Suffix Code	Measurement Type	Communication Format
AC50C	AC	Continuous ⁽¹⁾
DC50C	DC	Continuous ⁽¹⁾
50C	AC + DC	Continuous ⁽¹⁾
50M	AC + DC	MODBUS-RTU ⁽²⁾

1. Continuous: UART interface, external reset method (RST pull low to GND).

2. Modbus-RTU: UART interface, TX (Transmitter) / RX (Receiver), internal reset method.

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

Pad Description:

Pad No	Pad Name	I/O	Description
1	VDD	-	The positive power input pin
2	GND	-	The system ground
3	RST	I	The system reset
4	X	-	Reserve
5	X	-	
6	X	-	
7	RX	I	The data of measured current output. Its output is UART communication. The baud rate is 9.6K bits/sec.
8	TX	O	

Electrical Characteristics:
Common Operating Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V _{DD}	Operation Voltage	-	4.9	5	5.1	V
I _{DD}	Operation Current	-	-	8	10	mA
-	Conductor Through Hole	-	-	9	-	mm
T _{OP}	Operating Temperature	-	-20	-	70	°C

-WCM1800
T_{OP} = 25 °C, V_{DD} = 5.000V

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I _{OP}	DC Current Range	-	-25	-	+25	A
	AC Current Range	-	0	-	17	A
I _{RES}	Current Resolution	-	-	18	-	mA
E _{TOT}	Total Output Error	I _{OP} < 5A	-	50	-	mA
		I _{OP} > 5A	-	1	-	%
		Over full range of I _{op} T _{OP} =-20°C to 70°C	-	5	-	%

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WCM1X00

-WCM1700

$T_{OP} = 25\text{ }^{\circ}\text{C}$, $V_{DD} = 5.000\text{V}$

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{OP}	DC Current Range	-	-50	-	+50	A
	AC Current Range	-	0	-	35	A
I_{RES}	Current Resolution	-	-	37	-	mA
E_{TOT}	Total Output Error	$I_{OP} < 10\text{A}$	-	100	-	mA
		$I_{OP} > 10\text{A}$	-	1	-	%
		Over full range of I_{op} $T_{OP} = -20\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$	-	5	-	%

-WCM1600

$T_{OP} = 25\text{ }^{\circ}\text{C}$, $V_{DD} = 5.000\text{V}$

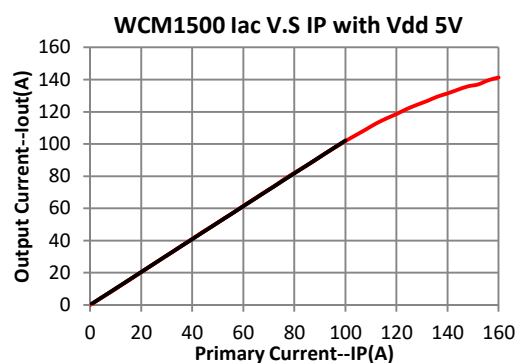
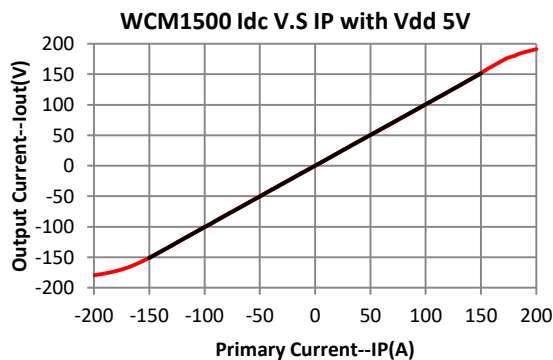
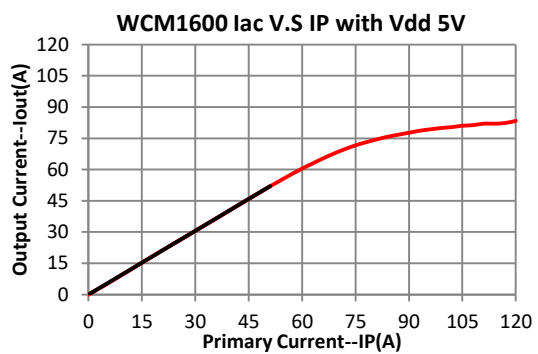
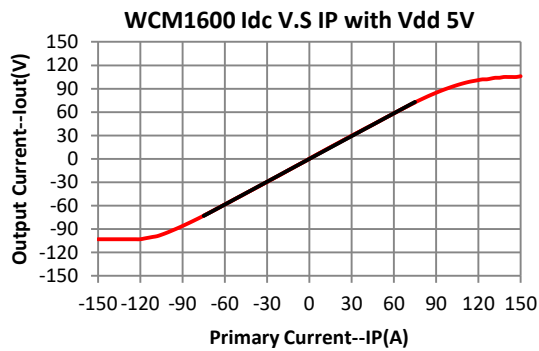
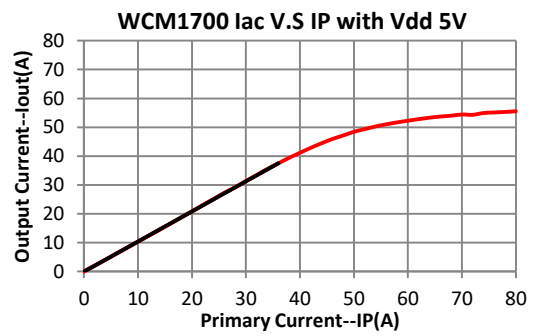
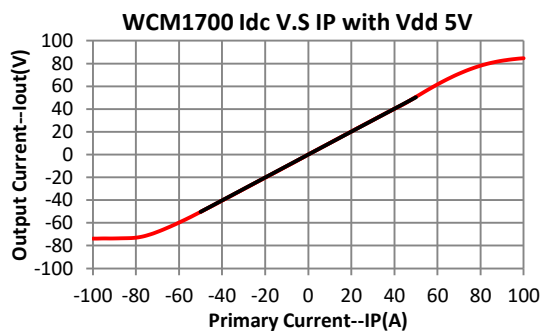
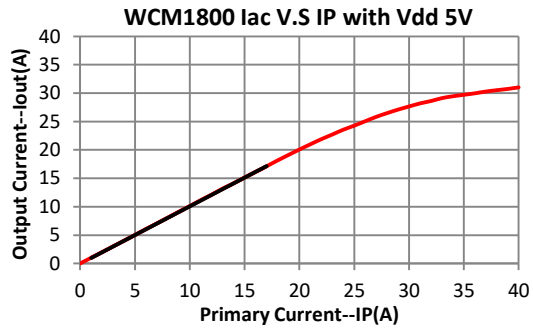
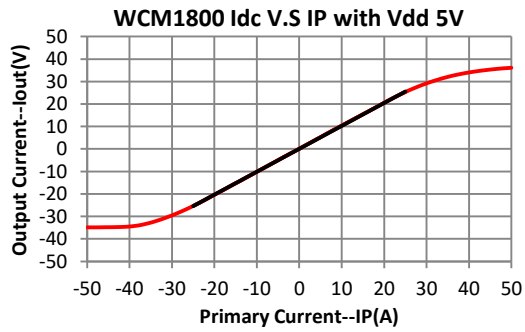
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{OP}	DC Current Range	-	-75	-	+75	A
	AC Current Range	-	0	-	50	A
I_{RES}	Current Resolution	-	-	54	-	mA
E_{TOT}	Total Output Error	$I_{OP} < 15\text{A}$	-	150	-	mA
		$I_{OP} > 15\text{A}$	-	1	-	%
		Over full range of I_{op} $T_{OP} = -20\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$	-	5	-	%

-WCM1500

$T_{OP} = 25\text{ }^{\circ}\text{C}$, $V_{DD} = 5.000\text{V}$

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{OP}	DC Current Range	-	-150	-	+150	A
	AC Current Range	-	0	-	100	A
I_{RES}	Current Resolution	-	-	110	-	mA
E_{TOT}	Total Output Error	$I_{OP} < 30\text{A}$	-	300	-	mA
		$I_{OP} > 30\text{A}$	-	1	-	%
		Over full range of I_{op} $T_{OP} = -20\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$	-	5	-	%

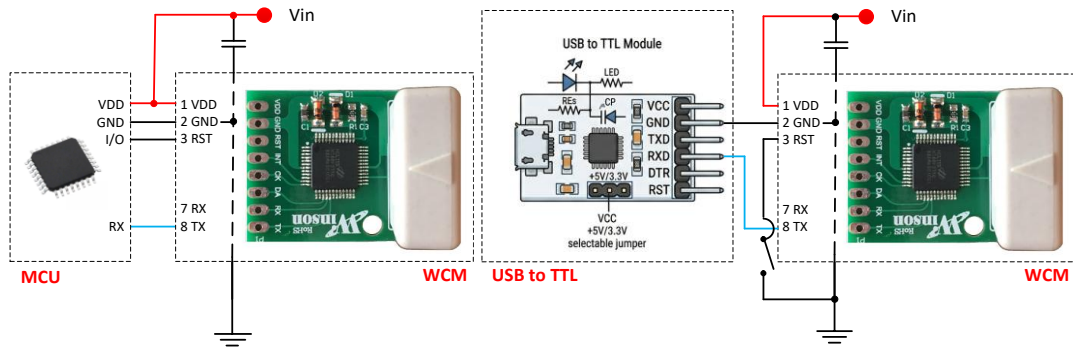
Winson reserves the right to make changes to improve reliability or manufacturability.



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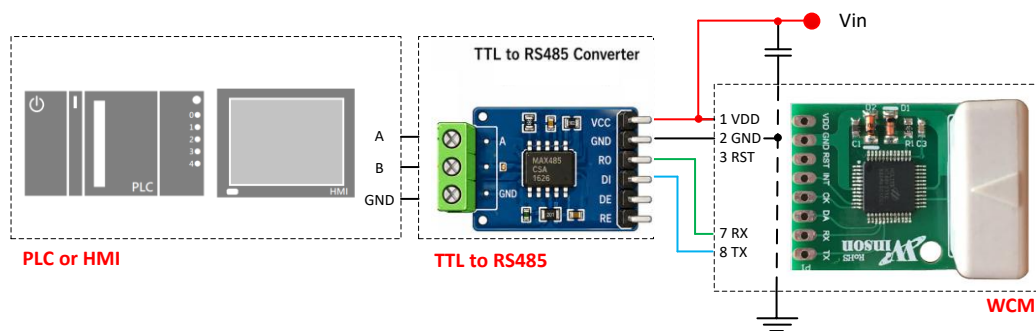
Application Note:

Application Diagram:

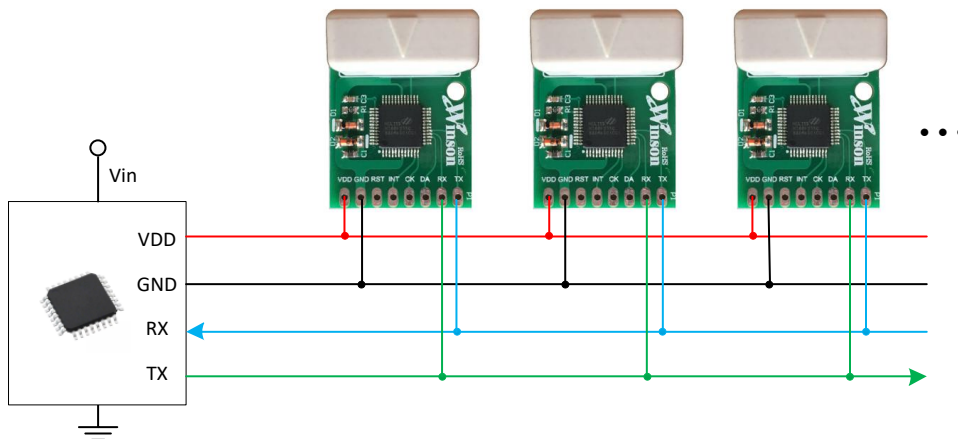


APP. 1. Output UART signal with MCU

APP. 2. Output UART signal with USB to TTL



APP. 3. Output UART signal with TTL to RS485



APP. 4. Modbus Connection

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Output Format**1. Continuous Mode**

For example description, please refer to the "Current Module Application Note":

Measured currents are continuously output via UART (ASCII) in fixed 8-byte frames: **[Sign] [5-digit Value] [CR] [LF]**

• Sign Definition:

~: Alternating Current (AC)

+: Positive Direct Current (DC+)

- : Negative Direct Current (DC-)

• Numerical Format:

Fixed 5-digit integer (excluding decimal point); padded with leading zeros if necessary.

Example: 1.23 A → 01230

Example: 10.76 A → 10760

• Termination Codes:

\r : Carriage Return

\n : Line Feed

• Output Examples :

AC 1.23 A → ~01230\r\n

AC 10.76 A → ~10760\r\n

DC+ 1.23 A → +01230\r\n

DC- 1.23 A → -01230\r\n

2. WCM1500 Output Format (Exceptions)

The WCM1500 outputs fixed 8-byte ASCII frames with an explicit decimal point:

[Sign] [Integer] [.] [Fraction] [CR] [LF]

• Output Examples :

AC 1.23 A → ~1.230\r\n

AC 10.76 A → ~10.76\r\n

DC+ 1.23 A → +1.230\r\n

DC- 100.8 A → -100.8\r\n

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3. Modbus-RTU Mode

For example description, please refer to the "Current Module Application Note:

Transmission Format (Read & Write)

Slave Address	Function Code	Add. of Registers (High byte first)	No. of Registers (High byte first)	CRC16 (Low byte first)
1 Byte	1 Byte	2 Byte	2 Byte	2 Byte

Receive Format (Read)

Slave Address	Function Code	Byte Count	Data (High byte first)	CRC16 (Low byte first)
1 Byte	1 Byte	1 Byte	N x Byte	2 Byte

Receive Format (Write): Echoes the transmitted data format.

Receive Format: exception

Slave Address	Function Code	Exception Code	CRC16 (Low byte first)
1 Byte	1 Byte	1 Byte	2 Byte

Exceptions set the function code's MSB to 1 (0x80 + Function Code).

• Function Code

03H: Read up to 125 continuous memory words

06H: Write one memory word

• Exception Code

01H: Illegal function code

02H: Illegal data address

03H: Illegal data count

Modbus Parameter List

Item	Address	Byte	R/W	Description
Reset	0x0000	2	Write	Input 256 to Reset
Current	0x0002	4	Read	Hexadecimal signed (HEX), Unit:0.001A Current= HEX / 1000 (A)
Temperature	0x0004	4	Read	Hexadecimal signed (HEX), Unit:0.1°C Temperature= HEX / 10 (°C)
Slave Address	0x0010	2	Write	Default address: 1 Input address1~247
DC / AC	0x0020	2	Write	0: DC / 1: AC

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True RMS Current Measurement:

In order to calculate true RMS of AC current, you need to know “zero” value of AC current first. The “zero” value of symmetric AC current is the average value $V_o(dc)$ of the current shown in Figure 1.

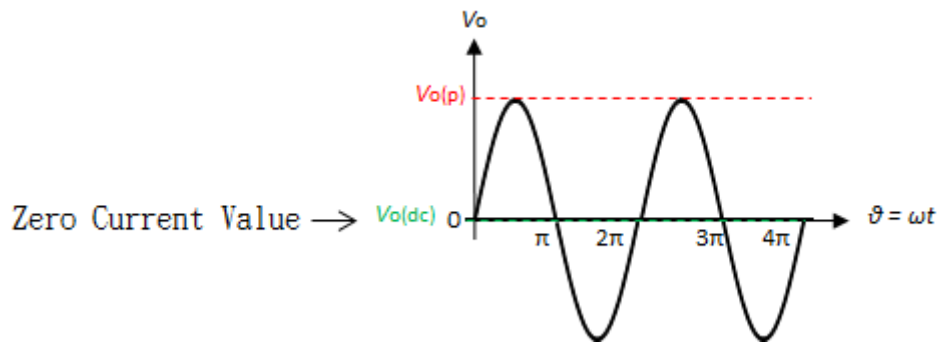


Figure 1 The zero current value of sine waveform

But in asymmetrical AC current, the “zero” value is not the average value $V_o(dc)$ of the current. Based on this “zero” value and do RMS calculation. You will get wrong answer.

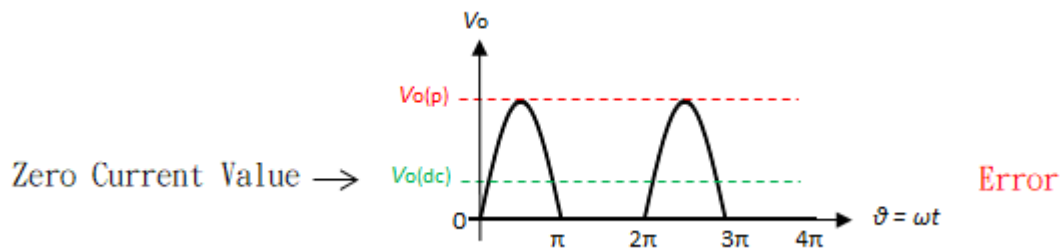


Figure 2 The zero current value of the asymmetric waveform (Error)

The WCM series offer a true RMS solution for both symmetric and asymmetric AC current. It can correctly detect “zero” current value, shown in Figure 3. and do perfect RMS calculation.

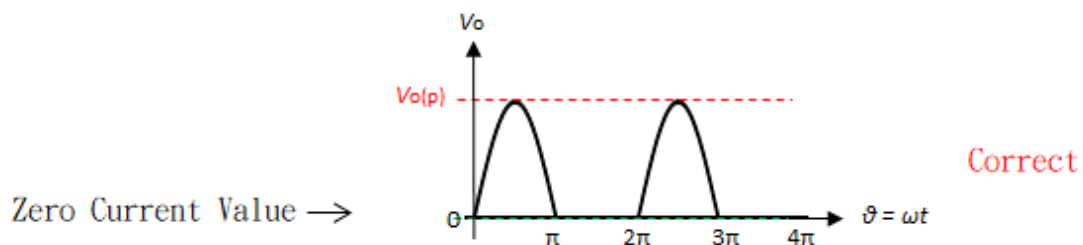
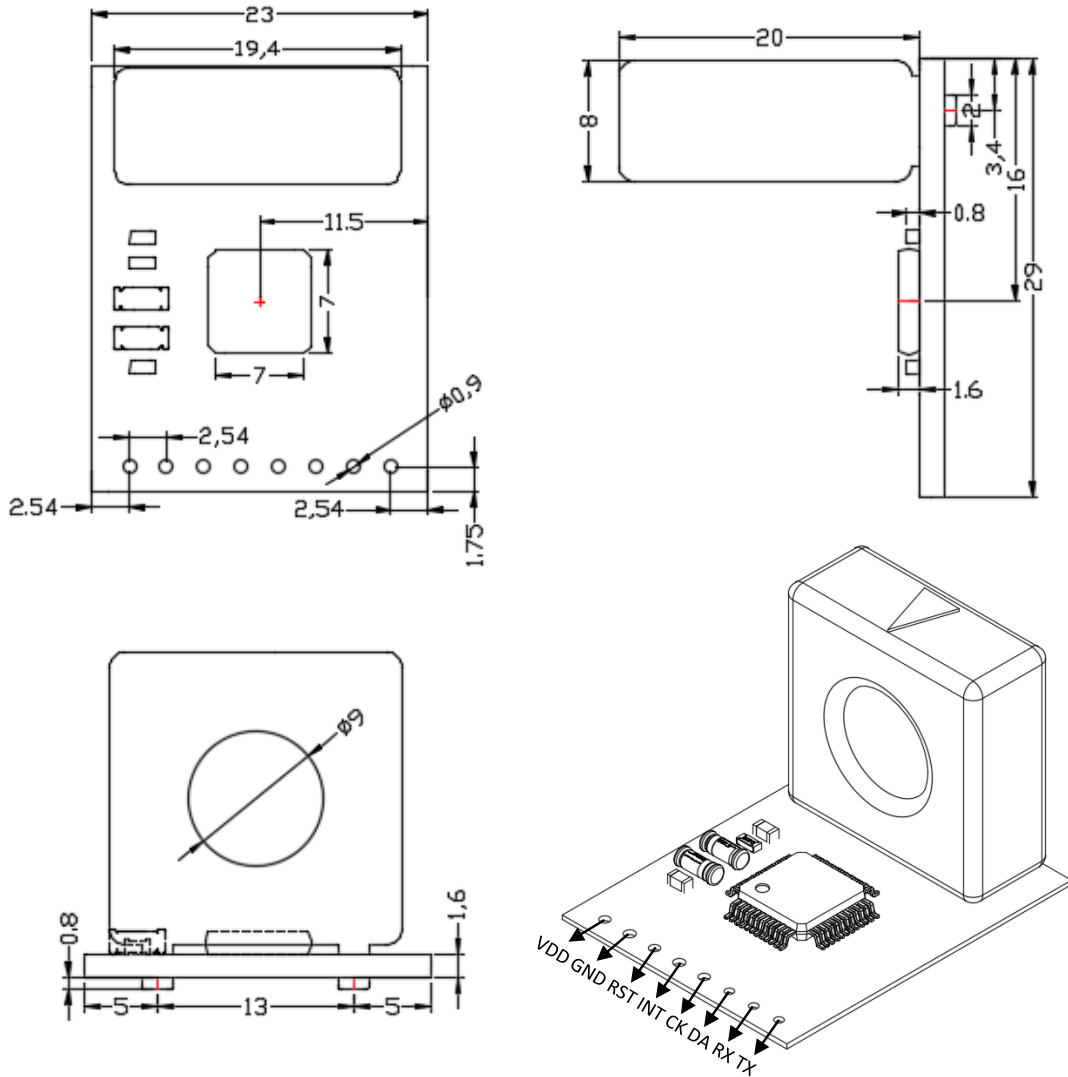


Figure 3 The zero current value of the asymmetric waveform (Correct)

Package:

(Unit: mm)



WCM Application Note : please refer to Winson Website -> Products-> Application Note -> WCM Application Note :
<http://www.winson.com.tw/Product/83>

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