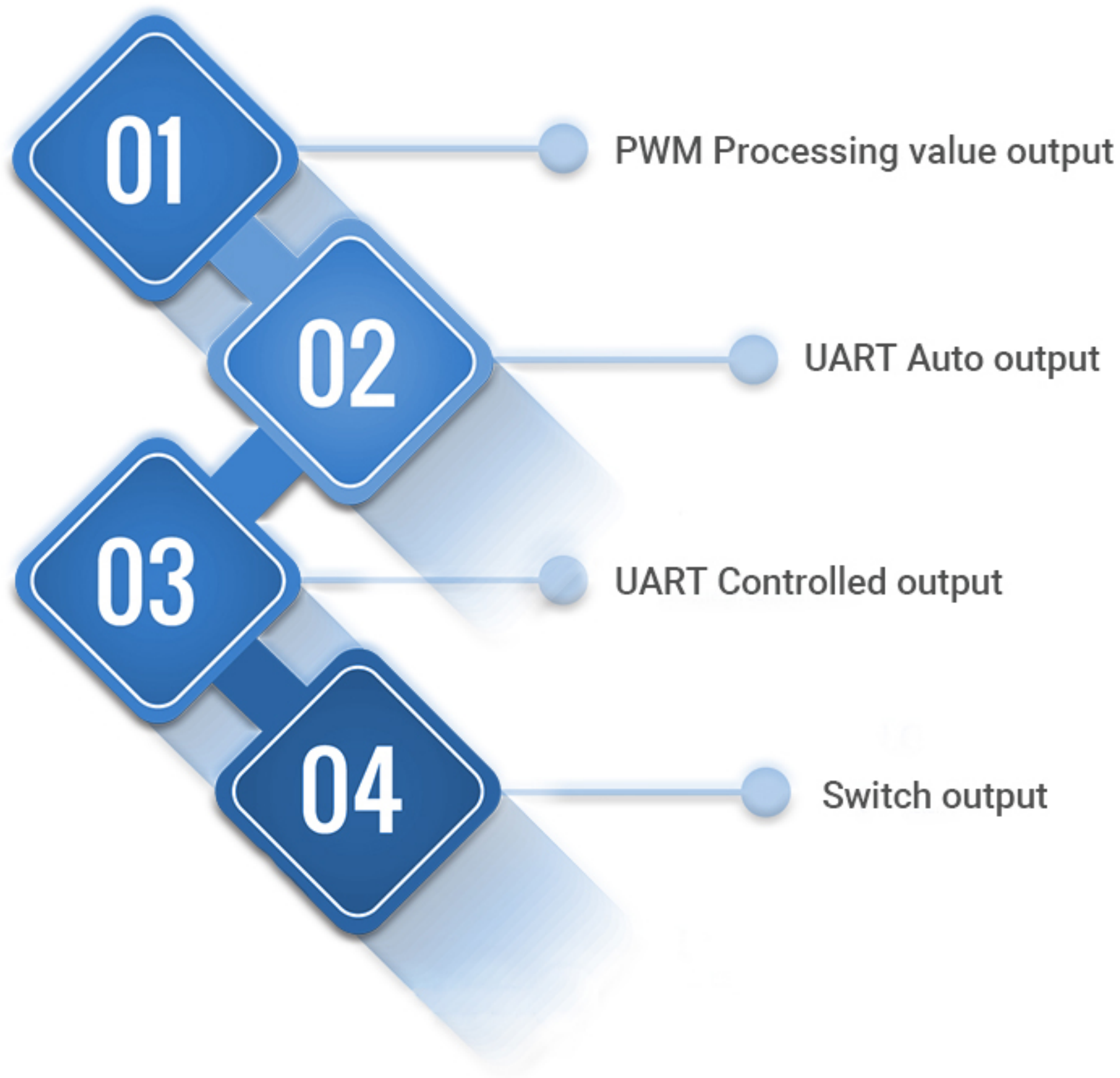


A08 Module Output Interface



The module has four output modes: PWM processing value output, UART automatic output, UART controlled output and switch output, which are mainly set by software. Choose different models to set the module to different output modes.

1. PWN Processing value

The PWM processing value output interface is simple and flexible, connected with digital or analog circuits to realize ranging applications.

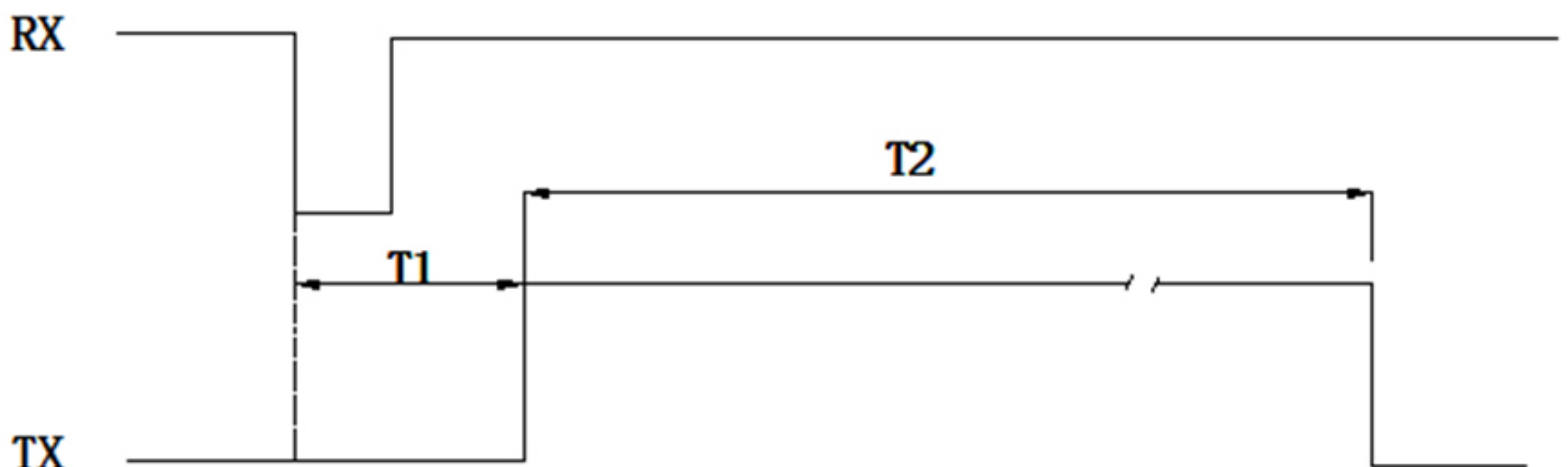
(1) Pin definition

| Pin No. | Mark | Pin description | Remark |
|---------|------|-----------------------------|--------|
| ③ | RX | Signal input | |
| ④ | TX | PWM processing value output | |

(2) Instruction

When Pin 3(RX) receives a falling edge pulse, the module will be awakened from sleep mode and start working, running a detection. After the detection is completed, pin4(TX) will output a high-level pulse width signal, the high-level duration of pin4(TX) corresponds to the distance between the detection target and the module. Trigger cycle of A08A must be greater than 200ms, greater than 100ms of A08B. Pin4(TX) will output a fixed pulse width if module does not detect an object, A08A is 71ms and 35ms of A08B.

(3) Timing Diagram



Remark:

A08A module: T1=70ms-100ms; T2=1.4ms~71ms (Timing of PWM High-level pulse width)

A08B module: T1=30ms-50ms; T2=1.4ms~35ms (Timing of PWM High-level pulse width)

RX falling edge trigger pulse width is recommended to be between 10us~2ms

(4) Formula

Formula: $S = T \cdot V / 2$ (S is the distance value, T is duration time of PWM high-level pulse width, V is sound travel speed in the air)

Because of internal temperature compensation, V is directly calculated at speed of 348m/S at room temperature. The simplified formula is $S = T / 57.5$ (unit of S in centimeters and us of time T)

For example: The duration time(T2)of PWM high-level pulse width is 10000us, the $S = T / 57.5 = 10000 / 57.5 \approx 173.9(\text{cm})$, means 173.9cm distance value.

2. UART Auto Output

UART auto output mode outputs measured distance value according to UART communication format, this mode does not require an external trigger signal. Operating cycle of A08A and A08B is 100ms a time, output distance value through pin(TX) after finished. Operating cycle of A08C is 500ms, pin(TX) output the measured distance value after five measurements are completed. (The operating cycle can be customized and developed according to customer needs) This output mode can reduce the user's single-chip I/O port usage, and at least one I/O port is required to achieve distance measurement (RX is disconnected, processing value output).

(1) Pin Definition

| Pin No. | Mark | Pin description | Remark |
|---------|------|---|--------|
| ③ | RX | Processing value and real time value output | |
| ④ | TX | UART output | |

(2) UART Instruction

When Pin(RX) is disconnect or the input is high level, the module outputs processed value, the data is more stable, response time is 500ms. When pin(RX) input low level, the module outputs real-time value, the response time is about 100ms. If the output value is "0", it means that the module has not detected an object.

| UART | Data Bit | Stop Bit | Parity Bit | Baud Rate |
|------|----------|----------|------------|-----------|
| TTL | 8 | 1 | | 9600bps |

(3) UART Output format

| Data Frame | Description | Byte |
|------------|----------------------|-------|
| Start Bit | 0XFF 0XFF | 1byte |
| Data_H | High8 distance value | 1byte |
| Data_L | Low8 distance value | 1byte |
| SUM | Parity sum | 1byte |

(4) Example of UART Output

| Start Bit | Data_H | Data_L | SUM |
|-----------|--------|--------|------|
| 0XFF | 0X01 | 0XA1 | 0XA7 |

Remark: Parity sum only remain low8 value.

$SUM = (start\ bit + Data_H + Data_L) \& 0x00FF$

$= (0XFF + 0X07 + 0XA1) \& 0x00FF$

$= 0XA7$

Distance value = $Data_H * 256 + Data_L = 0X07A1$;

Convert to decimal equal to 1953

Means current measurement distance value is 1953mm

3. UART Controlled Output

UART controlled mode outputs measured distance value according to UART communication format. When pin(RX) receives a falling edge pulse, the module will perform a measurements, measured distance value output through pin(TX) after completed. This output mode can control the measurement cycle and reduce power consumption. It is recommended to use with battery power supply.

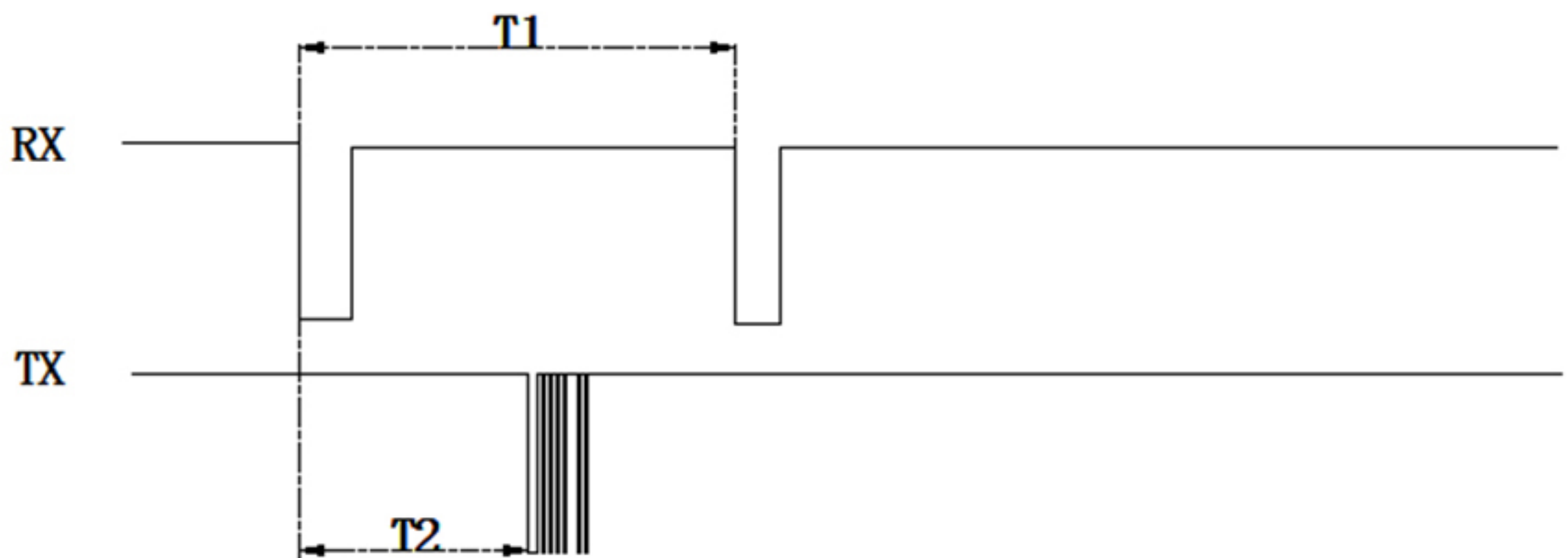
(1) Pin Definition

| Pin No. | Mark | Pin description | Remark |
|---------|------|----------------------|--------|
| ③ | RX | Trigger signal input | |
| ④ | TX | UART output | |

(2) UART Instruction

| UART | Data Bit | Stop Bit | Parity Bit | Baud Rate |
|-----------|----------|----------|------------|-----------|
| TTL level | 8 | 1 | | 9600bps |

(3) Timing Diagram



Remark : A08A module: $T1 > 100\text{ms}$; $T2 = 75 \sim 90\text{ms}$

A08B module: $T1 > 60\text{ms}$; $T2 = 40 \sim 50\text{ms}$

Suggest timing between 10us and 2ms of RX falling edge pulse width

(4) UART output format

| Data Frame | Description | Byte |
|------------|----------------------|-------|
| Start Bit | 0XFF 0XFF | 1byte |
| Data_H | High8 distance value | 1byte |
| Data_L | Low8 distance value | 1byte |
| SUM | Parity sum | 1byte |

(5) Example of UART Output

| Start Bit | Data_H | Data_L | SUM |
|-----------|--------|--------|------|
| 0XFF | 0X07 | 0XA1 | 0XA7 |

Remark: Parity sum only remain low8 value.

$$\text{SUM} = (\text{Start Bit} + \text{Data_H} + \text{Data_L}) \& 0x00FF$$

$$= (0XFF + 0X07 + 0XA1) \& 0x00FF$$

$$= 0XA7$$

$$\text{Distance value} = \text{Data_H} \times 256 + \text{Data_L} = 0X07A1$$

Converts to decimal equal to 1953, means current measurement distance value is 1953mm

4. Switch Output

The switch output interface is simple, the distance can be measured only by simple connect to analog or digital circuit.

(1) Pin Definition

| Pin No. | Mark | Pin Description | Remark |
|---------|------|------------------------|--------|
| ③ | RX | Switch negative output | |
| ④ | TX | Switch positive output | |

(2) Instruction

Factory setting a thresholds of 1.5 meter. The module performs distance measurement every 100ms. When the distance value less than threshold, the Pin(TX) output high level (3V), Pin(RX) output low level(0V). When the value greater than threshold, pin(TX) output low level(0V) and Pin(RX) output high level(3V).

In order to improve stability, the factory defaults that when the distance value of the target is detected 5 times in a row is less than the set thresholds, it is determined that the detected target distance is less than the set thresholds. The distance value of the target detected 10 times in a row is greater than the set thresholds. It is determined that the detected target distance is greater than the set threshold value. The Pin(TX) of the module only outputs high and low level signals without driving capability.

(3) Threshold value Setting

| Interface | Data Bit | Stop Bit | Parity Bit | Baud Rate |
|-----------|----------|----------|------------|-----------|
| TTL level | 8 | 1 | no | 9600bps |

(4) Threshold value format

| Frame data | Description | Byte |
|--------------|-------------|-------|
| Start Bit | 0XFB 0XFB | 1Byte |
| Command Code | 0X05 0X05 | 1Byte |
| Data_H | High 8 data | 1Byte |
| Data_L | Low 8 data | 1Byte |
| SUM | Parity sum | 1Byte |

(5) Example

| Start Bit | Command Cod | Data_H | Data_L | SUM |
|-----------|-------------|--------|--------|------|
| 0XFB | 0X05 | 0X03 | 0XE8 | 0XEB |

Remark: Parity sum only remain low 8 value.

Master: FB 05 03 E8 EB

Slave: FB 85 03 E8 00 6B

Setting successes, Switch distance value is 1000mm

Remark: Threshold value range 25-800cm of A08A, 25-500cm of A08B