ET9819 - Push Button Reboot Controller

General Description

ET9819 is a timer reset IC that supplies a reboot signal to the system when “L” voltage is input into the SW1, SW2 pins for a set time (reboot delay time) using two switches (physical buttons).

By changing the external resistance RT, the reboot delay time (TDL) can be set from 1s to 20s.

After the reboot signal (TRSTB) is output for 0.4s (TYP), the IC returns to the steady state automatically.

Quiescent current in standby mode is 0.01μA (TYP.), which is very small and leads to a longer battery drive time. The small DFN package reduces the mounting space.

In order to prevent malfunctioning of the IC, the UVLO function is equipped as a protective function.

Features

- Input Voltage Range: 1.75V ~ 6.0V
- Low power Consumption: 0.01μA (Stand-by, TYP.)
- Output Configuration: Nch open drain
- RSTB Pin SINK Current: 30mA (V_{RSTBL} = 0.3V.)
- Reboot Delay Time: 1s ~ 20s (Adjustable by the external resistor)
  *12.5s ± 5% (R_T = 200KΩ)
- Reboot Time: 0.4s ± 5%
- Operating Ambient Temperature: -40°C ~ +85°C
- Environmentally Friendly: RoHS Compliant, Pb Free
- Package: DFN6 (1mm × 1mm)

Device Information

Part No.	Package	Size	MSL
ET9819	DFN6	1.0mm × 1.0mm	Level 1

Application

- Wearable Devices
- Portable Music Players
- Portable Video Game Players
- Wireless Headsets
- Mobile Communication Devices
- Smart Phones, Feature Phones
- Various Applications Equipped with Buttons

Pin Assignments

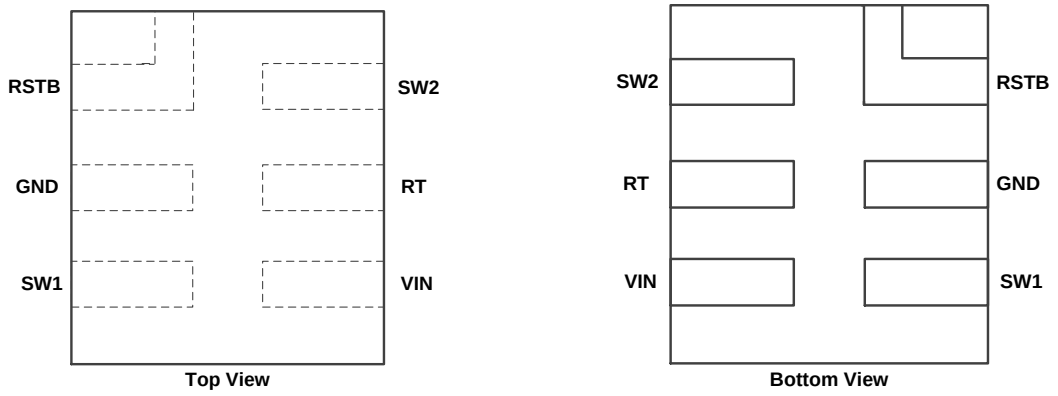


Figure 1. Pin Assignments

Pin Function

Pin No.	Name	Function
1	RSTB	Reboot Signal Output Pin
2	GND	Ground Pin
3	SW1	Switch Signal Input Pin1
4	VIN	Power Input Pin
5	RT	TDL adjusting resistor connection Pin
6	SW2	Switch Signal Input Pin2

Block Diagram

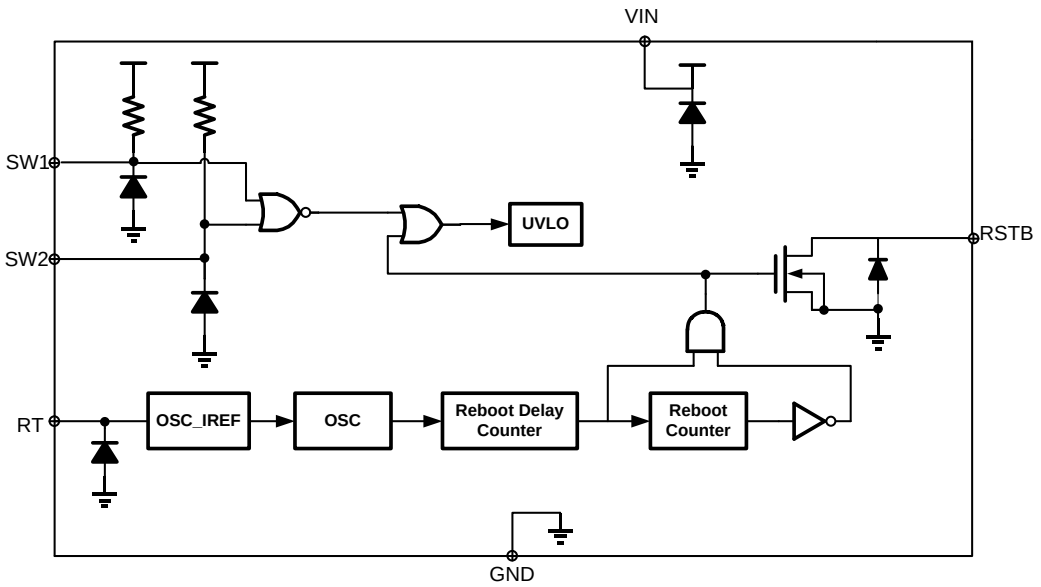


Figure 2. Block Diagram

***Note*:** The above diodes are elctrostatic protection diodes and parasitic diodes.

Functions Description

Function Table

PIN	BIAS CONDITION	STATUS
SW1	H	Standby Mode
	L	Active Mode
	OPEN	Standby Mode
SW2	H	Standby Mode
	L	Active Mode
	OPEN	Standby Mode

***Note*:** When either the SW1 pin or the SW2 pin is H-level, the IC enters Standby Mode.

Operation Explanation

ET9819 supplies a reboot signal (TRSTB below) to the system by inputting “L” voltage into the SW1, SW2 pins for the set time (reboot delay time) using two switches (buttons).

On the ET9819, a reboot delay time (TDL below) is set by connecting a resistance (RT below) to the RT pin.

TDL is determined by the following calculation formula:

$$RT(k\Omega) = \frac{TDL(s) - 0.097}{0.062015}$$

***Note*:** TDL can be set within the range 1s to 20s.

e.g.) When TDL=12.5s, RT=200KΩ.

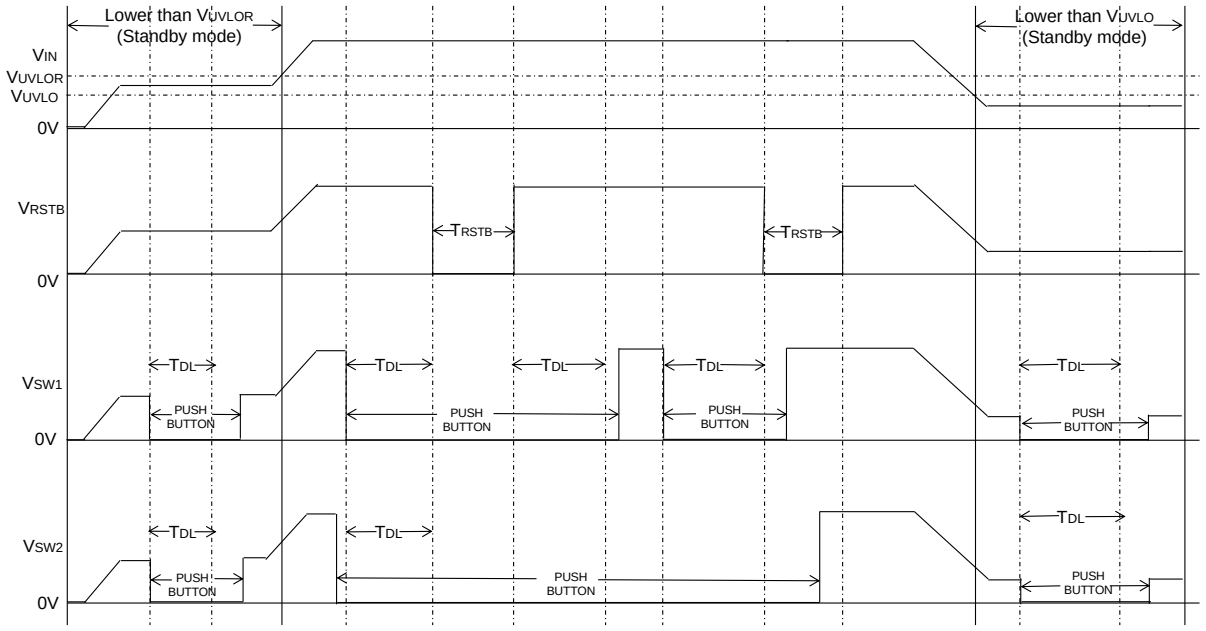


Figure 3. Timing Chart

Details of each circuit part are as follows.

SW1 PIN, SW2 PIN

By inputting “L” voltage into both of these pins during the TDL interval, the reboot signal is output from the RSTB pin. Both pins are pulled up to VIN by internal resistances, and the pin voltage maintains the VIN level when OPEN.

The UVLO circuit is activated by inputting “L” voltage into both the SW1 pin and the SW2 pin.

RT PIN

RT is connected to this pin to set TDL.

UVLO

This circuit prevents malfunctioning of the IC and allows the internal circuit to operate normally.

When the “L” voltage is detected input into both the SW1 and SW2 pins, the VIN pin voltage is monitored.

When the VIN pin voltage is higher than the UVLO release voltage, a signal that allows the internal circuit to operate is output by the UVLO circuit.

When the VIN pin voltage is lower than the UVLO detect voltage, a signal that puts the internal circuit in the standby state is output by the UVLO circuit.

When “H” voltage is input into the SW1 pin or SW2 pin (or both), the UVLO circuit does not operate and the internal circuitry enters the standby state.

OSC IREF

This is a current reference circuit for the OSC circuit which is set by RT connected to the RT pin.

OSC

This is an oscillation circuit which uses the reference current of the OSC IREF circuit.

This circuit outputs an oscillation pulse signal that activates the Reboot Delay Counter and Reboot Counter.

Reboot Delay Counter

This circuit counts the oscillation pulse signal generated by the OSC circuit and generates the TDL.

When the count is over, the circuit outputs a signal that places the RSTB pin voltage at “L” level and activates the Reboot Counter.

If a signal from the UVLO circuit that changes the state to the standby state is detected during the count, the count returns to the initial state.

Reboot Counter

By counting the oscillation pulse signal generated by the OSC circuit, the reboot time (TRSTB) is generated. The count starts when it detects the start signal that is output from the Reboot Delay Counter.

If a change-to-standby signal, which is output from the UVLO circuit, is detected during the counting process, the count returns to the initial state. When the count ends on the ET9819, the circuit outputs a signal that places the RSTB pin in a high-impedance state.

If “H” voltage is input into the SW1 pin or SW2 pin (or both) during the counting process, the internal circuit does not change to the standby state until the count ends.

Output driver

The ET9819 is an N-ch open drain output driver. The driver is in the OFF state when the Reboot Counter is not operating.

After the reboot signal output is completed, “H” voltage must be input into the SW1 pin and SW2 pin (or both) to activate the reboot signal output again. When “L” voltage is input into both the SW1 and SW2 pins after “H” voltage, the reboot signal is output from the RSTB pin and then TDL elapses.

Absolute Maximum Ratings

Absolute maximum ratings are limited values to be applied individually, and beyond which the serviceability of the circuit may be impaired. Functional operability is not necessarily implied. Exposure to absolute maximum rating conditions for an extended period of time may affect device reliability.

Parameter	Symbol	Min	Max	Unit
VIN Pin Voltage	V_{IN}	-0.3	7.0	V
SW1 Pin Voltage	V_{SW1}	-0.3	7.0	V
SW2 Pin Voltage	V_{SW2}	-0.3	7.0	V
RT Pin Voltage	V_{RT}	-0.3	V_{IN}+0.3 or 7.0 (*)	V
RSTB Pin Voltage	V_{RSTB}	-0.3	7.0	V
RSTB Pin SINK Current	I_{SINK}	40		mA
Power Dissipation	P_D	600		mW
Operating Ambient Temperature	T_A	-40	85	°C
Storage Temperature	T_{STG}	-55	125	°C

Note * :

- The maximum value is the lower of either V_{IN}+0.3 or +7.0V.
- Each voltage rating is based on the reference GND.

Electrical Characteristics

(Unless otherwise noted, the reference is GND, VIN=3.7V, RT=200KΩ, SW1=open, SW2=open,T_A=25℃)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	Circuit
Input Voltage Range	V_{IN}	-	1.75	-	6.00	V	①
UVLO Release Voltage	V_{UVLOR}	V_{IN}=SWEEP (step up), V_{SW1}=GND, V_{SW2}=GND	-	1.55	1.65	V	①
UVLO Detect Voltage(1)	V_{UVLO}	V_{IN}=SWEEP (step down), V_{SW1} =GND, V_{SW2}=GND	1.35	1.47	-	V	①
Quiescent Current	I_Q	V_{IN}=6.0V,	-	0.01	0.10	μA	①
Operating Current(2)	I_{DD}	V_{IN}=6.0V, V_{SW1}=GND, V_{SW2}=GND	17	50	93	μA	①

Electrical Characteristics (Continued)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	Circuit
Reboot Delay Time(3)	T_{DL}	V_{SW1}=GND, V_{SW2}=GND	11.875	12.500	13.125	s	②
Reboot Time(4)	T_{RSTB}	V_{SW1}=GND, V_{SW2}=GND * After TDL	0.38	0.40	0.42	s	②
RSTB Pin(5)(6) SINK Current	I_{SINK}	V_{RSTB}=0.3V	30	-		mA	①
SW1 Pin "H" Voltage	V_{SW1H}	V_{IN}=6.0V	1.0	-	6.0	V	①
SW1 Pin "L" Voltage	V_{SW1L}	V_{IN}=6.0V	GND	-	0.3	V	①
SW1 Pin "H" Current	I_{SW1H}	V_{IN}=6.0V, V_{SW1}=6.0V	-0.1	-	0.1	μA	①
SW1 Pin "L" Current	I_{SW1L}	V_{IN}=6.0V, V_{SW1}=GND	3.5	7.5	16.0	μA	①
SW2 Pin "H" Voltage	V_{SW2H}	V_{IN}=6.0V	1.0	-	6.0	V	①
SW2 Pin "L" Voltage	V_{SW2L}	V_{IN}=6.0V	GND	-	0.3	V	①
SW2 Pin "H" Current	I_{SW2H}	V_{IN}=6.0V, V_{SW2}=6.0V	-0.1	-	0.1	μA	①
SW2 Pin "L" Current	I_{SW2L}	V_{IN}=6.0V, V_{SW2}=GND	3.5	7.5	16.0	μA	①

***Notes*:**

1. The UVLO detect voltage is less than the UVLO release voltage.

2. Quiescent current until the reboot signal is output in the circuit operation state with the SW1, SW2 pin at "L" level.

3. Time from change of both SW1 and SW2 pin voltages to "L" level until the RSTB pin outputs "L" level.

4. Time from change of RSTB pin to "L" level until RSTB pin changes to "H" level.

5. RSTB pin "L" level is as follows: Applied voltage×0.1.

6. RSTB pin "H" level is as follows: Applied voltage×0.9.

Application circuit

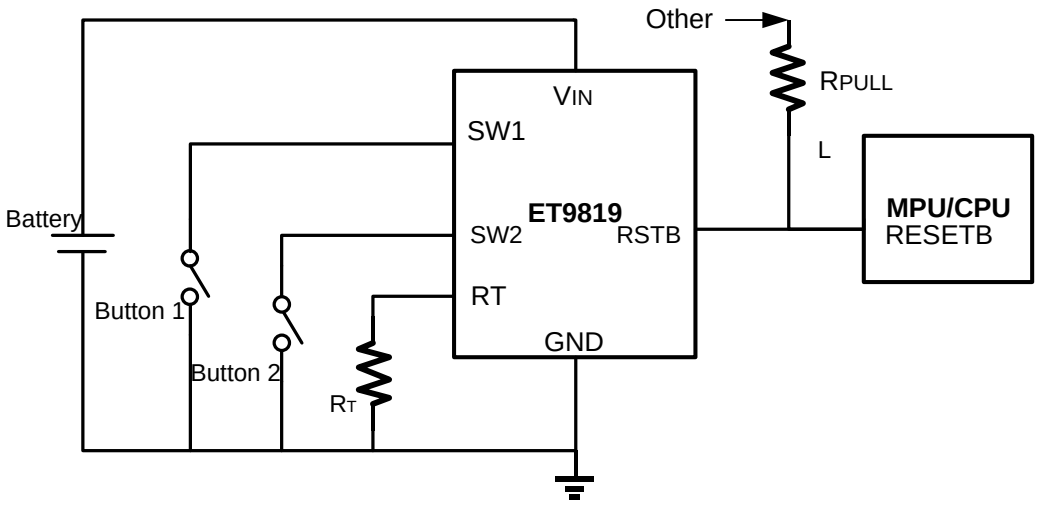


Figure 4. Typical Application(*)

Note *: Please connect a capacitor of at least 0.01uF between VIN-GND near the IC as needed.

Test Circuit 1

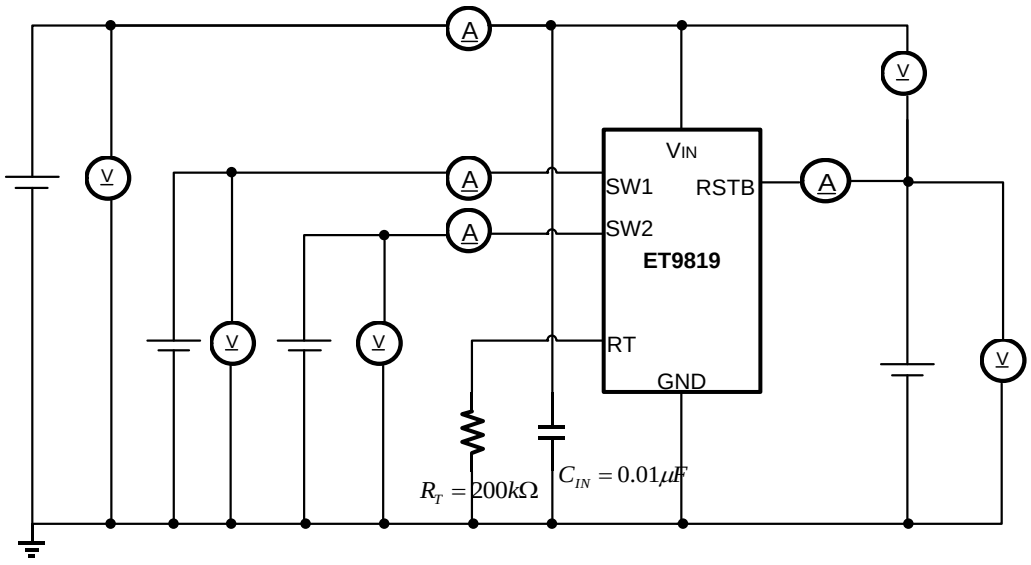


Figure 5. Test Circuit ①

Note : Please connect a capacitor of at least 0.01uF between VIN - GND near the IC as needed.

Test Circuit 2

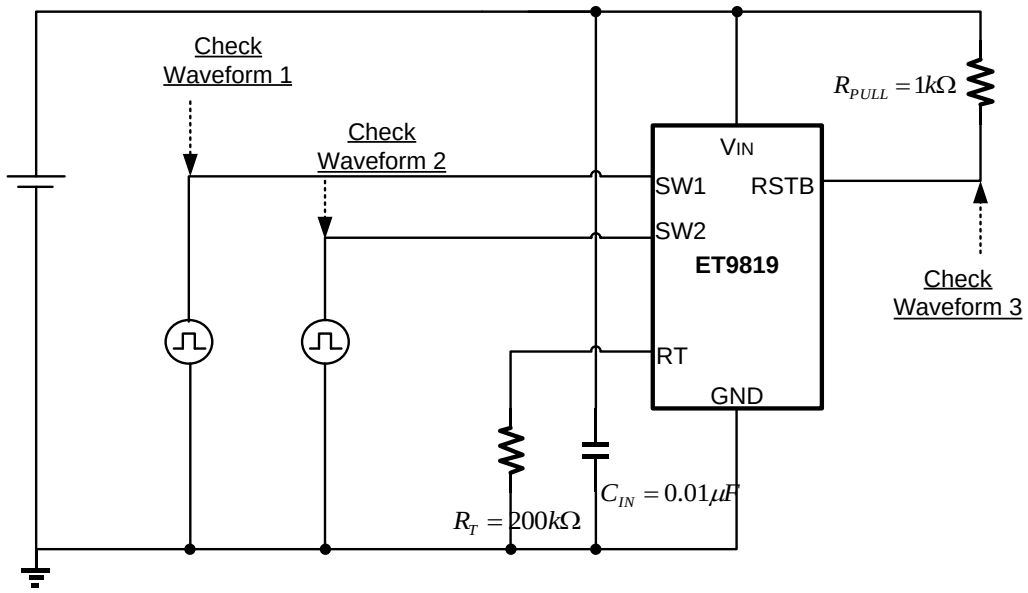
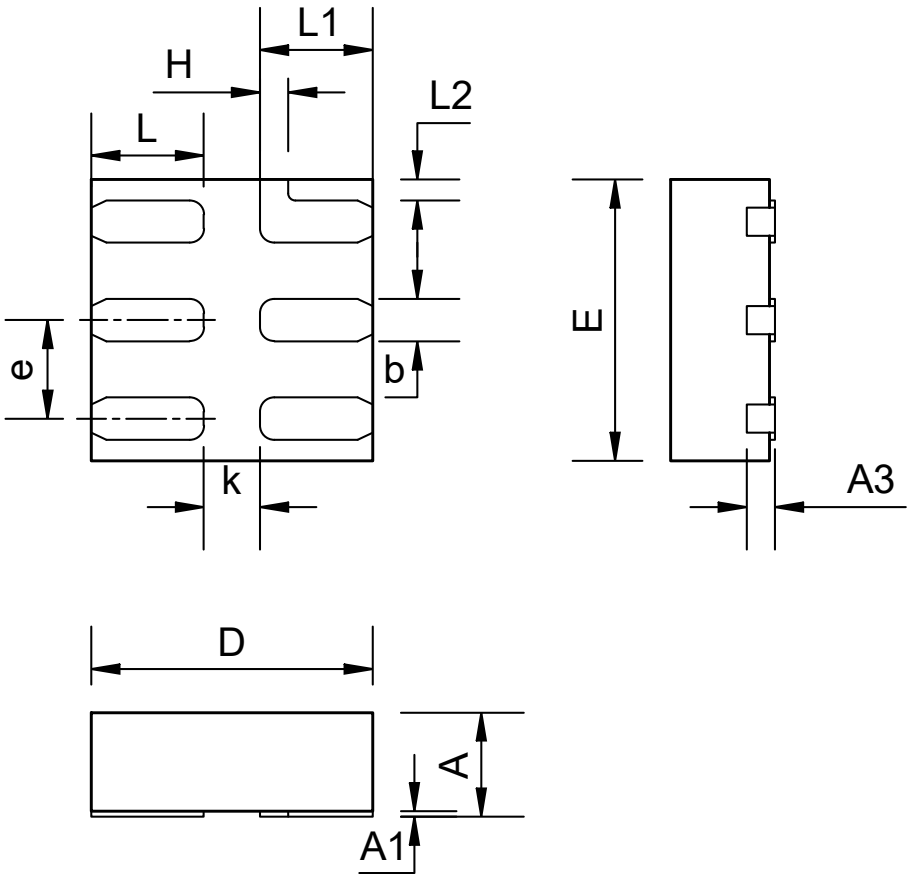


Figure 5. Test Circuit ②

Note **:** Please connect a capacitor of at least 0.01uF between VIN - GND near the IC as needed.

Package



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A3		0.100REF	
b	0.10	0.15	0.20
D	0.95	1.00	1.05
E	0.95	1.00	1.05
e	0.30	0.35	0.40
H		0.10REF	
K	0.15	-	-
L	0.35	0.40	0.45
L1	0.35	0.40	0.45
L2		0.075REF	

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2020-10-28	Preliminary Version	Wanggp	Wanggp	Liujy
1.1	2021-09-30	Released Version	Wanggp	Wanggp	Liujy
1.2	2022-11-09	Update Typeset	Lvyj	Wanggp	Liujy