

# Supply Voltage Supervisor with Watchdog and Manual Reset

## 1 FEATURES

- Operating Voltage Range: 1.2V to 5.5V
- Low Power Consumption: 50µA (Max)
- Precision Supply-Voltage Monitor: 2.63V, 2.93V, 3.08V, 4.00V, 4.65V
- Guaranteed  $\overline{\text{RESET}}$  Valid at  $V_{CC}=1.2V$
- 200ms Reset Pulse Width
- Voltage Monitor for Power-Fail or Low-Battery Warning
- Operating Temperature Range: -40°C to +125°C
- Available in Green Package: SOT23-5

## 2 APPLICATIONS

- Computers
- SOC、DSP or Micro controllers
- Embedded Systems
- Industrial Equipment
- Intelligent Instruments
- Critical µP Power Monitoring
- Wireless Communications Systems

## 3 DESCRIPTIONS

The RS806 microprocessor (µP) supervisory circuits reduce the complexity and number of components required to monitor power-supply and battery function in µP systems. This device significantly improves system reliability and accuracy compared to separate ICs or discrete components.

The RS806 provide four functions:

- 1) A reset output during power-up, power-down, and brownout conditions. The reset output remains operational with  $V_{CC}$  as low as 1.2V.
- 2)  $\overline{\text{RESET}}$  output that goes low if the watchdog input has not been toggled within 1.6 seconds (typ).
- 3) A 1.2V threshold detector for power-fail warning, low-battery detection, or for monitoring a power supply.
- 4) An active-low manual-reset input.

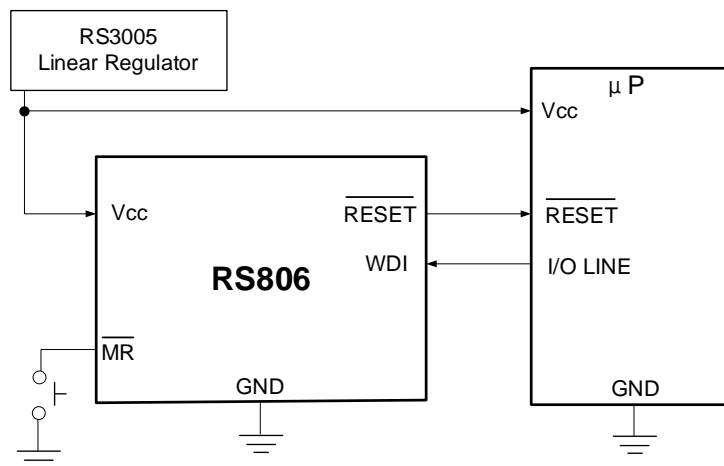
The RS806 is available in Green SOT23-5 package. It operates over an ambient temperature range of -40°C to +125°C.

Device Information <sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS806	SOT23-5	2.92mm x 1.60mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

## 4 TYPICAL APPLICATION



## Table of Contents

<b>1 FEATURES</b> .....	1
<b>2 APPLICATIONS</b> .....	1
<b>3 DESCRIPTIONS</b> .....	1
<b>4 TYPICAL APPLICATION</b> .....	1
<b>5 Revision History</b> .....	3
<b>6 PACKAGE/ORDERING INFORMATION</b> <sup>(1)</sup> .....	4
<b>7 PIN CONFIGURATIONS</b> .....	5
<b>8 Specifications</b> .....	6
8.1 Absolute Maximum Ratings <sup>(1)</sup> .....	6
8.2 ESD Ratings .....	6
8.3 ELECTRICAL CHARACTERISTICS .....	7
8.4 TYPICAL OPERATING CHARACTERISTICS .....	8
<b>9 Function Block Diagram</b> .....	10
<b>10 Detailed Description</b> .....	11
10.1 Reset Output .....	11
10.2 Watchdog Timer .....	11
10.3 Manual Reset .....	11
<b>11 Applications Information</b> .....	12
11.1 Ensuring a Valid RESET Output Down to $V_{CC}=0V$ .....	12
11.2 Interfacing to $\mu$ Ps with Bidirectional Reset Pins .....	12
<b>12 PACKAGE OUTLINE DIMENSIONS</b> .....	13
<b>13 TAPE AND REEL INFORMATION</b> .....	14

## 5 Revision History

Note: Page numbers for previous revisions may differ from page numbers in the current version.

Version	Change Date	Change Item
A.1	2021/08/09	Initial version completed
A.2	2023/07/24	<ol style="list-style-type: none"><li>1. Update PACKAGE MARKING on Page 5@RevA.1</li><li>2. Update Operating Temperature Range: -40°C to +125°C</li><li>3. Modify Operating Voltage Range: 1.2V to 5.5V</li><li>4. Update ESD Ratings</li><li>5. Added RS806-4.65YF5 ORDERING NUMBER</li></ol>

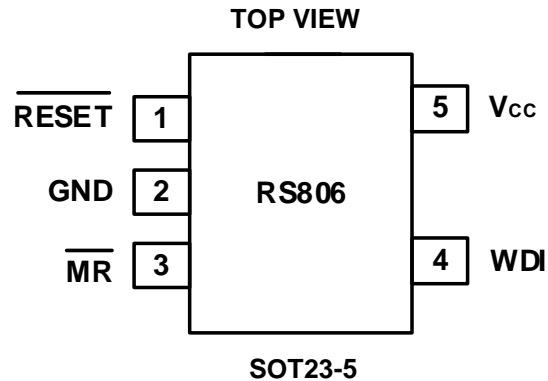
**6 PACKAGE/ORDERING INFORMATION (1)**

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING (2/3)	PACKAGE OPTION
RS806	RS806-2.63YF5	-40°C ~+125°C	SOT23-5	806B	Tape and Reel,3000
	RS806-2.93YF5	-40°C ~+125°C	SOT23-5	806C	Tape and Reel,3000
	RS806-3.08YF5	-40°C ~+125°C	SOT23-5	806D	Tape and Reel,3000
	RS806-4.00YF5	-40°C ~+125°C	SOT23-5	806E	Tape and Reel,3000
	RS806-4.65YF5	-40°C ~+125°C	SOT23-5	806G	Tape and Reel,3000

**NOTE:**

- (1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
- (2) There may be additional marking, which relates to the lot trace code information(data code and vendor code), the logo or the environmental category on the device.
- (3) B, C, D, E, G represents different Reset Thresholds.

## 7 PIN CONFIGURATIONS



### PIN DESCRIPTION

PIN	NAME	FUNCTION
SOT23-5		
1	$\overline{\text{RESET}}$	Active-Low Reset Output pulses low for 200ms when triggered, and stays low whenever $V_{cc}$ is below the reset threshold. It remains low for 200ms after $V_{cc}$ rises above the reset threshold or $\overline{\text{MR}}$ goes from low to high.
2	GND	Ground, reference for all signals.
3	$\overline{\text{MR}}$	Manual-Reset Input triggers a reset pulse when pulled below $0.1 \cdot V_{cc}$ . This active-low input has an internal pull-up resistance. It can be shorted to ground with a switch.
4	WDI	Watchdog Input. If WDI remains high or low 1.6sec, the internal watchdog timer runs out and reset goes low. Floating WDI or connecting WDI to a high-impedance three-state buffer disables the watchdog feature. The internal watchdog timer clears whenever reset is asserted, WDI is three-stated, or WDI sees a rising or falling edge.
5	$V_{cc}$	Power Supply Voltage that is monitored.

## 8 Specifications

### 8.1 Absolute Maximum Ratings <sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted) <sup>(1)(2)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	6.0	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	-0.5	6.0	V
V <sub>O</sub>	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	6.0	V
V <sub>O</sub>	Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>	-0.5	V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> <0	-20	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> <0	-20	mA
I <sub>O</sub>	Continuous output current		±20	mA
	Continuous current through V <sub>CC</sub> or GND		±20	mA
θ <sub>JA</sub>	Package thermal impedance <sup>(4)</sup>	SOT23-5	230	°C/W
T <sub>J</sub>	Junction temperature <sup>(5)</sup>	-65	150	°C
T <sub>stg</sub>	Storage temperature	-65	150	°C
T <sub>A</sub>	Operating temperature	-40	125	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The value of V<sub>CC</sub> is provided in the *Recommended Operating Conditions table*.

(4) The package thermal impedance is calculated in accordance with JESD-51.

(5) The maximum power dissipation is a function of T<sub>J(MAX)</sub>, R<sub>θJA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any ambient temperature is P<sub>D</sub> = (T<sub>J(MAX)</sub> - T<sub>A</sub>) / R<sub>θJA</sub>. All numbers apply for packages soldered directly onto a PCB.

### 8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

		VALUE	UNIT
V <sub>(ESD)</sub> Electrostatic discharge	Human-body model (HBM), MIL-STD-883K METHOD 3015.9	±4000	V
	Machine model (MM), JESD22-A115C (2010)	±200	V



#### ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 8.3 ELECTRICAL CHARACTERISTICS

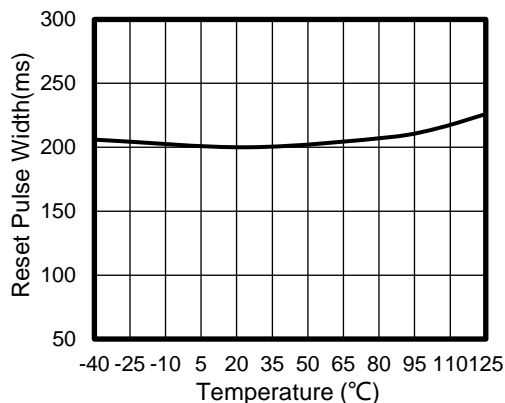
( $V_{CC} = 2.74V$  to  $5.5V$  for RS806-2.63;  $V_{CC} = 3.05V$  to  $5.5V$  for RS806-2.93;  $V_{CC} = 3.21V$  to  $5.5V$  for RS806-3.08;  $V_{CC} = 4.17V$  to  $5.5V$  for RS806-4.00;  $V_{CC} = 4.84V$  to  $5.5V$  for RS806-4.65;  $T_A = -40^{\circ}C$  to  $+125^{\circ}C$ , unless otherwise noted, typical at  $25^{\circ}C$ .)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage Range	$V_{CC}$		1.2		5.5	V
Supply Current	$I_{SUPPLY}$			20	50	$\mu A$
Reset Threshold	$V_{RT}$	RS806-2.63	2.50	2.63	2.74	V
		RS806-2.93	2.80	2.93	3.05	
		RS806-3.08	2.94	3.08	3.21	
		RS806-4.00	3.82	4.00	4.17	
		RS806-4.65	4.44	4.65	4.84	
Reset Threshold Hysteresis		RS806-2.63		12		mV
		RS806-2.93		14		
		RS806-3.08		15		
		RS806-4.00		20		
		RS806-4.65		23		
Reset Pulse Width	$t_{RS}$		100	200	460	ms
Reset Threshold Temperature Coefficient <sup>(1)</sup>				30		ppm/ $^{\circ}C$
$V_{CC}$ to $\overline{RESET}$ delay	$t_{RD}$	$V_{CC}=3.3V$ , RS806-2.93		33		$\mu s$
Watchdog Timeout Period	$t_{WD}$		1.0	1.6	3.7	s
WDI Pulse Width	$t_{WP}$	$V_{IL}=0.4V$ , $V_{IH}=V_{CC}$	50			ns
$\overline{RESET}$ Output voltage	High	$I_{SOURCE} = 500\mu A$	$0.7 \times V_{CC}$			V
	Low	$I_{SINK} = 1.2mA$			0.4	
WDI Input Threshold	High	$V_{CC}=5.0V$	4.0			V
	Low	$V_{CC}=5.0V$			0.8	
	High	$V_{RST(MAX)} < V_{CC} < 3.6V$	$0.85 \times V_{CC}$			
	Low	$V_{RST(MAX)} < V_{CC} < 3.6V$			$0.1 \times V_{CC}$	
WDI Input Current		WDI = $V_{CC}$		0.1	20	$\mu A$
		WDI = 0V	-20	-0.1		
$\overline{MR}$ Pull-Up Resistor			20	52	130	k $\Omega$
$\overline{MR}$ Pulse Width	$t_{MR}$		150			ns
$\overline{MR}$ Input Threshold	High	$V_{CC}=5.0V$	4.0			V
	Low	$V_{CC}=5.0V$			0.5	
	High	$V_{RST(MAX)} < V_{CC} < 3.6V$	$0.8 \times V_{CC}$			
	Low	$V_{RST(MAX)} < V_{CC} < 3.6V$			$0.1 \times V_{CC}$	
$\overline{MR}$ to Reset Out Delay	$t_{MD}$			23	200	ns

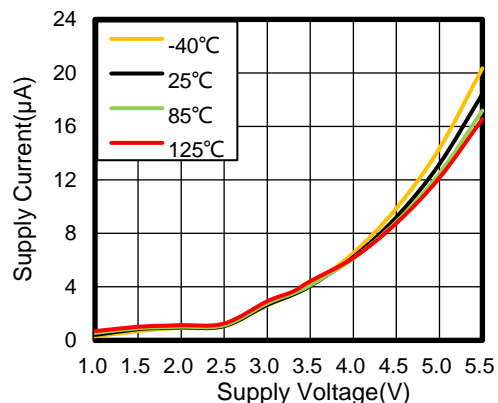
(1) This parameter is ensured by design and/or characterization and is not tested in production.

## 8.4 TYPICAL OPERATING CHARACTERISTICS

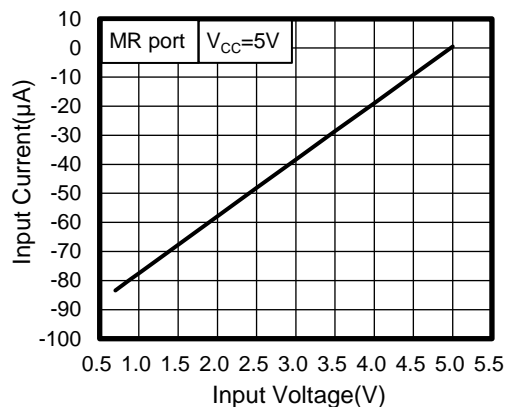
NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.



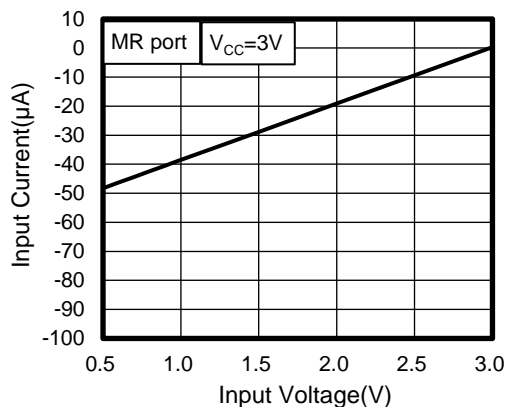
**Figure 1. Reset Pulse Width vs Temperature**



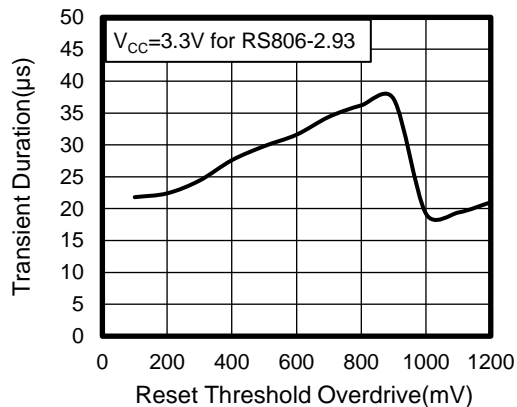
**Figure 2. Supply Voltage vs Supply Current**



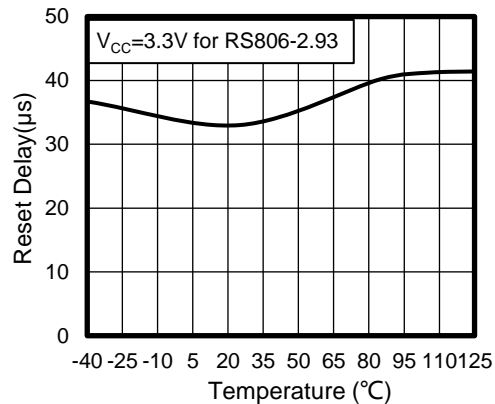
**Figure 3. Input Voltage vs Input Current**



**Figure 4. Input Voltage vs Input Current**



**Figure 5. Transient Duration vs Reset Threshold Overdrive**

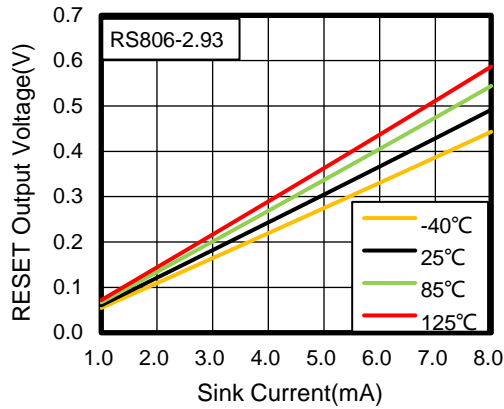


**Figure 6. Reset Delay vs Temperature**

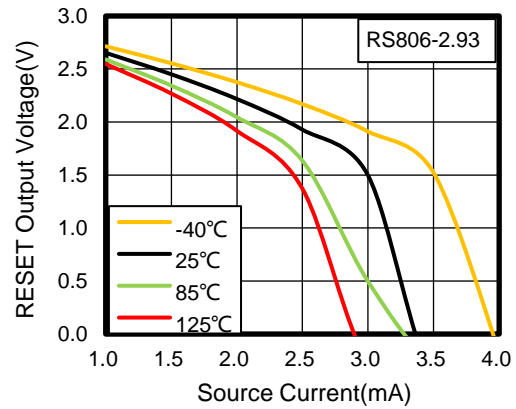


## TYPICAL OPERATING CHARACTERISTICS

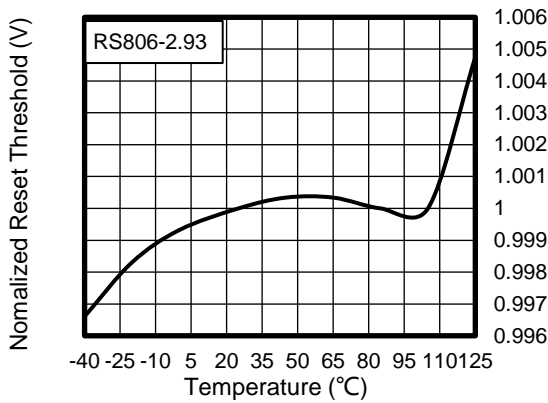
NOTE: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only.



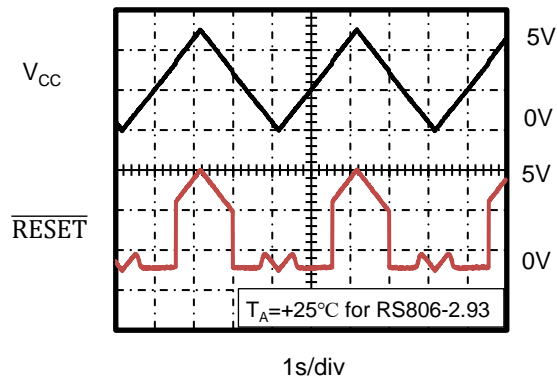
**Figure 7. RESET Output Voltage vs Sink Current**



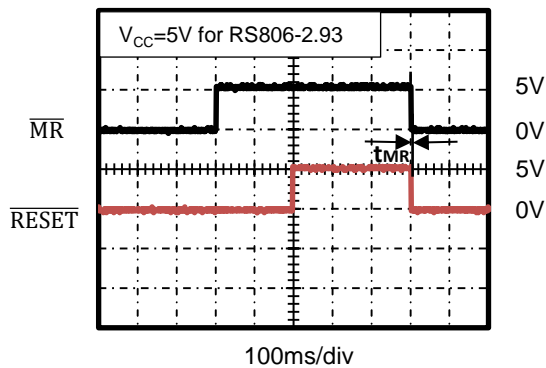
**Figure 8. RESET Output Voltage vs Source Current**



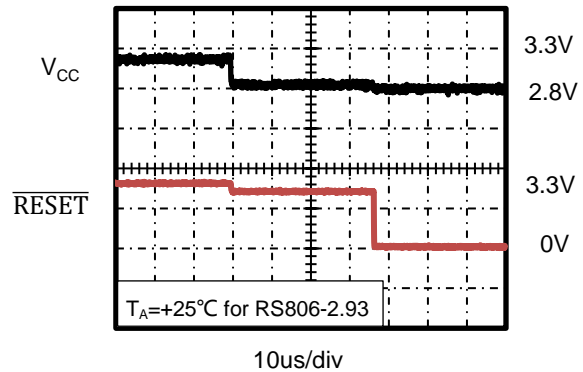
**Figure 9. Normalized Reset Threshold vs Temperature**



**Figure 10. RESET Output Voltage vs Supply Voltage**

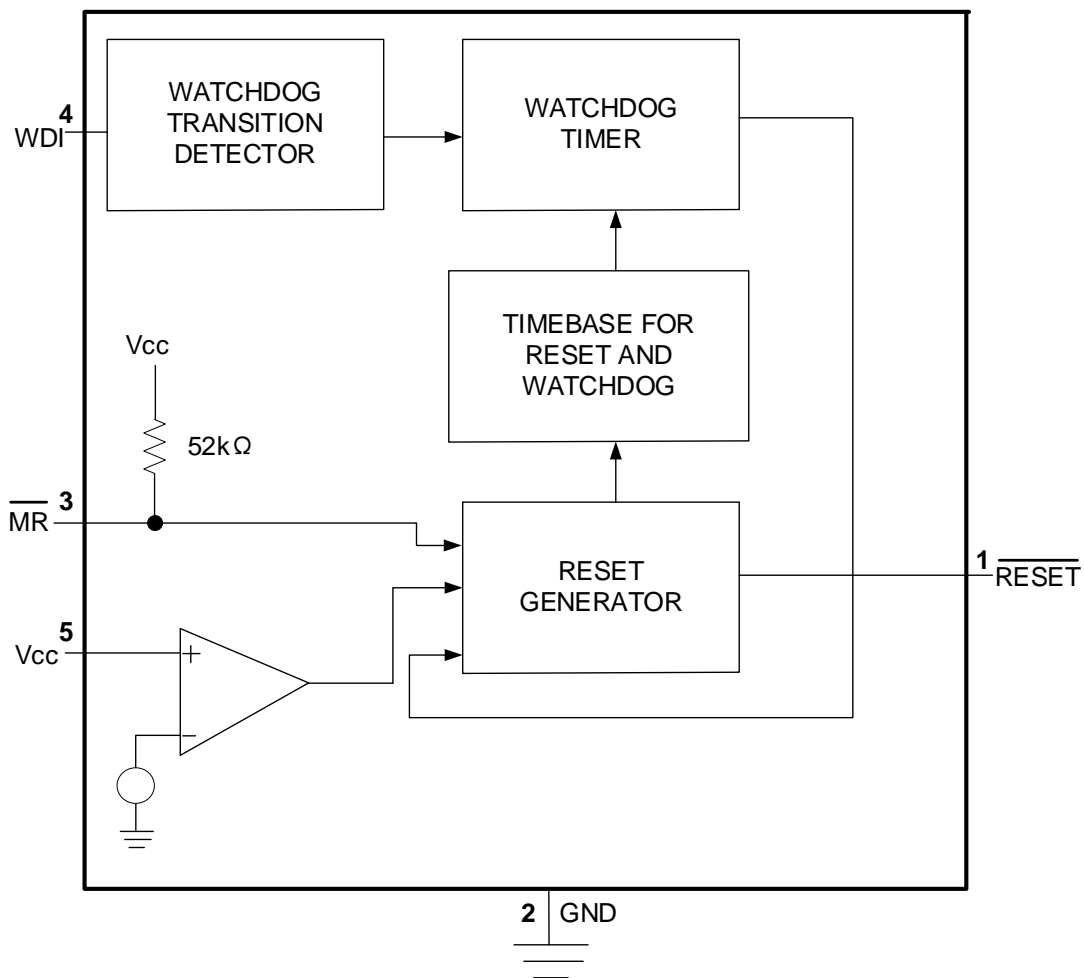


**Figure 11. RESET Timing**



**Figure 12. RESET Response Time**

### 9 Function Block Diagram



## 10 Detailed Description

### 10.1 Reset Output

A microprocessor's ( $\mu\text{P}$ 's) reset input starts the  $\mu\text{P}$  in a known state. Whenever the  $\mu\text{P}$  is in an unknown state, it should be held in reset. The RS806 asserts reset during power-up and prevents code execution errors during power-down or brownout conditions.

On power-up, once  $V_{\text{CC}}$  reaches 1.2V,  $\overline{\text{RESET}}$  is a guaranteed logic low of 0.4V or less. As  $V_{\text{CC}}$  rises,  $\overline{\text{RESET}}$  stays low. When  $V_{\text{CC}}$  rises above the reset threshold, an internal timer releases  $\overline{\text{RESET}}$  after about 200ms.  $\overline{\text{RESET}}$  pulses low whenever  $V_{\text{CC}}$  dips below the reset threshold. If brownout occurs in the middle of a previously initiated reset pulse, the pulse continues for at least another 100ms. On power-down, once  $V_{\text{CC}}$  falls below the reset threshold,  $\overline{\text{RESET}}$  stays low and is guaranteed to be 0.4V or less until  $V_{\text{CC}}$  drops below 1.2V.

### 10.2 Watchdog Timer

The RS806 watchdog circuit monitors the  $\mu\text{P}$ 's activity. If the  $\mu\text{P}$  does not toggle the watchdog input (WDI) within 1.6 sec (Minimum is 1.0 sec) and WDI is not three states,  $\overline{\text{RESET}}$  goes low. As long as  $\overline{\text{RESET}}$  is asserted or the WDI input is three states, the watchdog timer stays cleared and will not count. As soon as reset is released and WDI is driven high or low, the timer starts counting. Pulses as short as 50ns can be detected.

Typically,  $\overline{\text{RESET}}$  is not connected to the non-maskable interrupt input (NMI) of a  $\mu\text{P}$ . When  $V_{\text{CC}}$  drops below the reset threshold,  $\overline{\text{RESET}}$  goes low whether or not the watchdog timer has timed out yet. Normally this would trigger an NMI interrupt, but  $\overline{\text{RESET}}$  goes low simultaneously, and thus overrides the NMI interrupt.

If WDI is left unconnected,  $\overline{\text{RESET}}$  can be used as a low-line output. Since floating WDI disables the internal timer,  $\overline{\text{RESET}}$  goes low only when  $V_{\text{CC}}$  falls below the reset threshold, thus functioning as a low-line output.

### 10.3 Manual Reset

The manual-reset input ( $\overline{\text{MR}}$ ) allows reset to be triggered by a push-button switch. It can be driven by an external logic line.  $\overline{\text{MR}}$  can be used to force a watchdog timeout to generate a reset pulse in the RS806. Simply connect  $\overline{\text{RESET}}$  to  $\overline{\text{MR}}$ .

## 11 Applications Information

### 11.1 Ensuring a Valid RESET Output Down to $V_{CC}=0V$

When  $V_{CC}$  falls down below 1.2V, the RS806  $\overline{\text{RESET}}$  output no longer sinks current, it becomes an open circuit. High-impedance CMOS logic inputs can drift to undetermined voltages if left un-driven. If a pull-down resistor is added to the  $\overline{\text{RESET}}$  pin, as shown in Figure 13, any stray charge or leakage currents will be drained to ground, holding  $\overline{\text{RESET}}$  low. Resistor value (R1) is not critical. It should be about 100K $\Omega$ , large enough not to load  $\overline{\text{RESET}}$  and small enough to pull  $\overline{\text{RESET}}$  to ground.

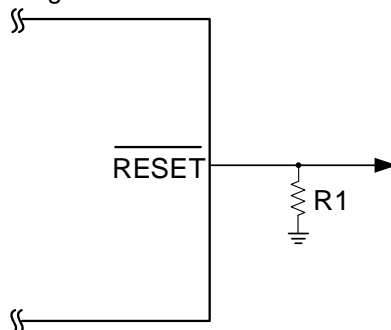


Figure 13. RESET Valid to Ground Circuit

### 11.2 Interfacing to $\mu\text{Ps}$ with Bidirectional Reset Pins

$\mu\text{Ps}$  with bidirectional reset pins, can contend with the RS806  $\overline{\text{RESET}}$  output. If, for example, the  $\overline{\text{RESET}}$  output is driven high and the  $\mu\text{P}$  wants to pull it low, indeterminate logic levels may result. To correct this, connect a 4.7K $\Omega$  resistor between the  $\overline{\text{RESET}}$  output and the  $\mu\text{P}$  reset I/O, as in Figure 14. Buffer the  $\overline{\text{RESET}}$  output to other system components.

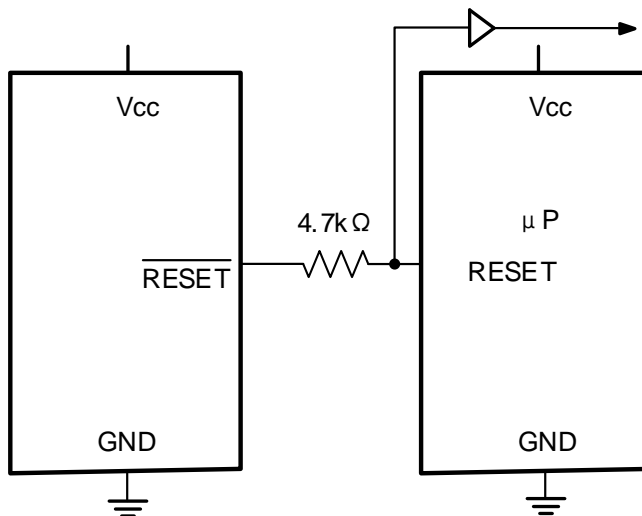
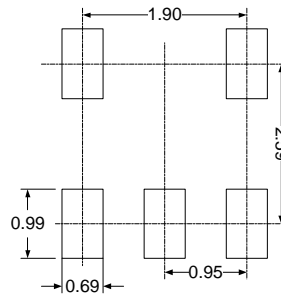
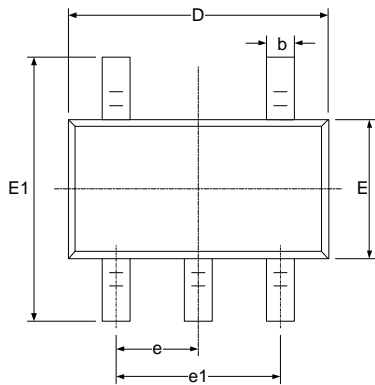
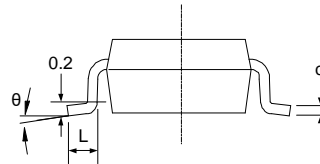
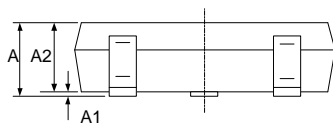


Figure 14. Buffered  $\overline{\text{RESET}}$  to other system components

# 12 PACKAGE OUTLINE DIMENSIONS

## SOT23-5 <sup>(3)</sup>


**RECOMMENDED LAND PATTERN (Unit: mm)**


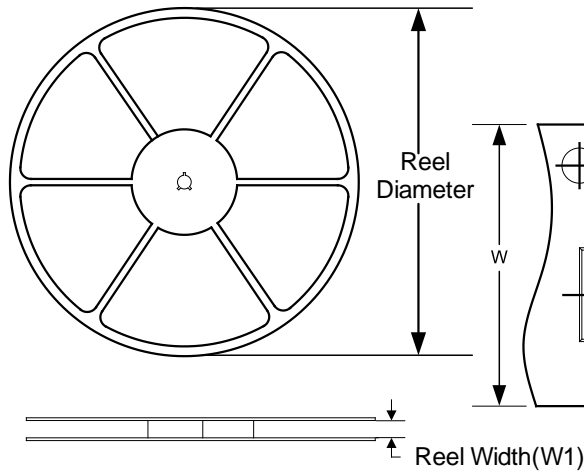
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A <sup>(1)</sup>	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D <sup>(1)</sup>	2.820	3.020	0.111	0.119
E <sup>(1)</sup>	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC) <sup>(2)</sup>		0.037(BSC) <sup>(2)</sup>	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

**NOTE:**

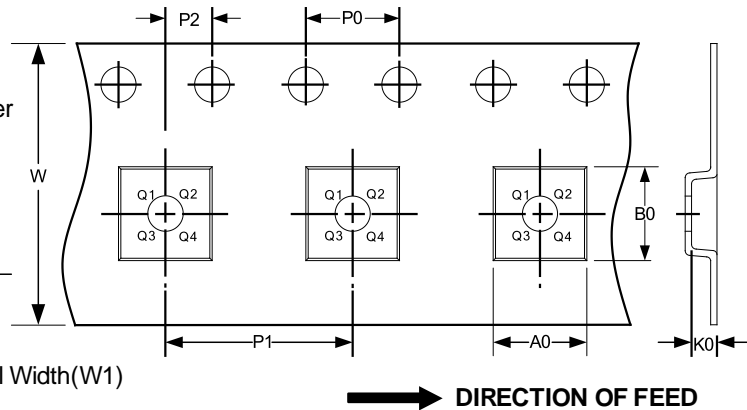
1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. This drawing is subject to change without notice.

### 13 TAPE AND REEL INFORMATION

#### REEL DIMENSIONS



#### TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

#### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.

## **IMPORTANT NOTICE AND DISCLAIMER**

Jiangsu Runic Technology Co., Ltd. will accurately and reliably provide technical and reliability data (including data sheets), design resources (including reference designs), application or other design advice, WEB tools, safety information and other resources, without warranty of any defect, and will not make any express or implied warranty, including but not limited to the warranty of merchantability Implied warranty that it is suitable for a specific purpose or does not infringe the intellectual property rights of any third party.

These resources are intended for skilled developers designing with Runic products You will be solely responsible for: (1) Selecting the appropriate products for your application; (2) Designing, validating and testing your application; (3) Ensuring your application meets applicable standards and any other safety, security or other requirements; (4) Runic and the Runic logo are registered trademarks of Runic Incorporated. All trademarks are the property of their respective owners; (5) For change details, review the revision history included in any revised document. The resources are subject to change without notice. Our company will not be liable for the use of this product and the infringement of patents or third-party intellectual property rights due to its use.