

ULTRA-SMALL BUILT-IN DELAY HIGH-PRECISION VOLTAGE DETECTOR

LR8809 SERIES

■ Introduction

The LR8809 Series is a series of high-precision voltage detectors with a built-in delay time generator of fixed time. developed using CMOS process. The detection voltage is fixed internally, with an accuracy of $\pm 2.0\%$. Internal oscillator and counter timer can delay the release signal without external parts, delay times 200 mS Two output forms, Nch pen-drain and CMOS output are available.

■ Application

- Memory battery back-up circuits
- Power-on reset circuits
- Power failure detection
- Power monitor for portable equipment such as notebook computers, digital cameras, PDA, and cellular phones.
- Constant voltage power monitors for cameras, video equipment and communication devices.
- Power monitor for microcomputers and reset for CPUs.

■ Features

- Ultra-low current consumption: $1.0\mu A@3.5V(\text{typ})$
- High-precision detection voltage: $\pm 2.0\%$
- Hysteresis characteristics: $-V_{DET} \times 5\%(\text{typ})$
- Operating voltage range: 0.95 V to 8.0 V
- Detection voltage: 1.5V to 6.0 V (0.1 V step)
- Delay time: 200 mS(typ)
- Output forms:
 - NMOS open-drain output (Active Low)
 - CMOS output (Active Low)

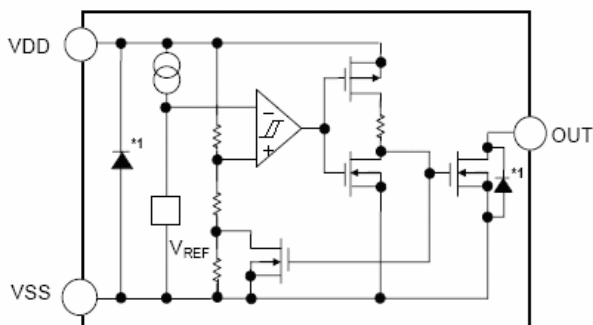
■ Ordering Information

LR8809 ①②③④

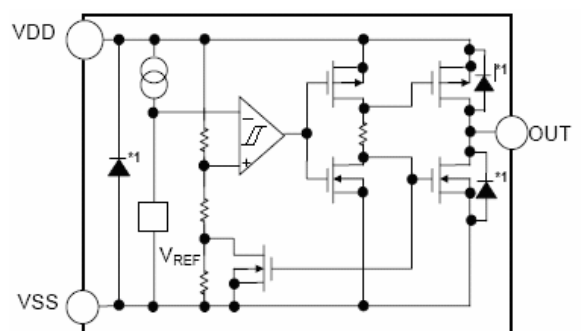
DESIGNATOR	SYMBOL	DESCRIPTION
①	C	CMOS
	N	Nch open drain
②③	Integer	Output Voltage(1.5V~6.0V) e.g. 3.0V= ②:3, ③:0
④	M/MA	Package: SOT23-3
	N/NA	Package: SOT343(SC-82)
	P	Package: SOT89-3
	T/TA	Package: TO-92
	E	Package: SOT23-6

■ Block Diagrams

Nch open-drain



CMOS output



Note:*1-parasitic diode

■ Pin Configurations

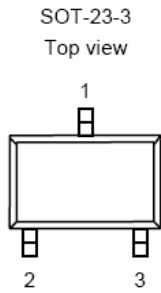


Table 1 LR8809 Series (SOT-23-3)

PIN NO.	M	MA	Functions
1	V_{DD}	V_{DD}	Voltage input pin
2	V_{OUT}	-	Voltage detection output pin
	-	V_{SS}	GND pin
3	V_{SS}	-	GND pin
	-	V_{OUT}	Voltage detection output pin

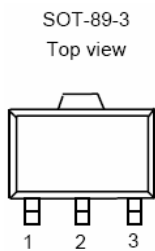


Table 2 LR8809 Series (SOT-89-3)

PIN NO	P	Functions
1	V_{OUT}	Voltage detection output pin
2	V_{DD}	Voltage input pin
3	V_{SS}	GND pin

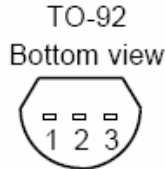


Table 3 LR8809 Series (TO-92)

PIN NO	T	TA	Functions
1	V_{OUT}	-	Voltage detection output pin
	-	V_{DD}	Voltage input pin
2	V_{DD}	-	Voltage input pin
	-	V_{SS}	GND pin
3	V_{SS}	-	GND pin
	-	V_{OUT}	Voltage detection output pin

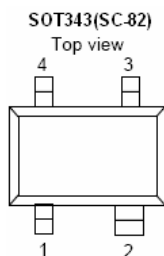
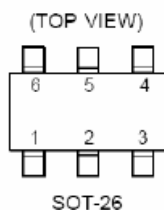


Table 4 LR8809 Series (SOT343)

PIN NO	N	NA	Functions
1	V_{OUT}	-	Voltage detection output pin
	-	V_{DD}	Voltage input pin
2	V_{DD}	-	Voltage input pin
		V_{SS}	GND pin
3	NC	-	No Connection
4	V_{SS}	-	GND pin
	-	V_{OUT}	Voltage detection output pin

Table 5 LR8809 Series (SOT23-6)


PIN NO	E	Functions
1	NC	No Connection
2	VSS	GND pin
3	VOUT	Voltage detection output pin
4	VDD	Voltage input pin
5	NC	No Connection
6	NC	No Connection

■ Absolute Maximum Ratings

(Ta=25°C unless otherwise specified)

Item		Symbol	Absolute maximum ratings	Unit
Power supply voltage		V_{DD}	$V_{SS}-0.3 \sim V_{SS}+10$	V
Output voltage		V_{OUT}	$V_{SS}-0.3 \sim V_{SS}+10$	V
Power dissipation	SOT-23-3	PD	250	mW
	SOT-89		500	mW
	TO-92		500	mW
	SOT343		250	mW
Operating ambient temperature		T_{opr}	$-40 \sim +85$	°C
Storage temperature		T_{stg}	$-40 \sim +125$	°C

■ Electrical Characteristics

(Ta=25°C unless otherwise specified)

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Detection voltage*1	$-V_{DET}$	—		$-V_{DET(S)} \times 0.98$	$-V_{DET(S)}$	$-V_{DET(S)} \times 1.02$	V
Hysteresis width	V_{HYS}	—		$0.02 \times -V_{DET(S)}$	$0.05 \times -V_{DET(S)}$	$0.08 \times -V_{DET(S)}$	V
Current consumption	I_{SS}	$V_{DD} = -V_{DET} + 0.5V$	CE8809C/N20~26	—	1.0	2.0	uA
			CE8809 C/N 26~39	—	1.2	2.5	uA
			CE8809 C/N 39~60	—	1.5	3.0	uA
Operating voltage	V_{DD}	—		0.95	—	8	V

Output current	I_{OUT}	NMOS: $V_{OUT} = 0.5\text{ V}$ $V_{DD} = -V_{DET} - 0.5\text{ V}$	CE8809 C/N 20~26	3.0	13.0	—	mA
			CE8809 C/N 26~39	3.0	15.0	—	mA
			CE8809 C/N 39~60	3.0	18.0	—	mA
		PMOS: $V_{DD} - V_{OUT} = 0.5\text{ V}$ $V_{DD} = -V_{DET} + 0.5\text{ V}$	CE8809 C/N 20~26	1.5	4.0	—	mA
			CE8809 C/N 26~39	1.5	6.0	—	mA
			CE8809 C/N 39~60	1.5	8.0	—	mA
Leakage current	I_{LEAK}	Only for NMOS open-drain output products, $V_{DD} = 8.0\text{ V}$, $V_{OUT} = 8.0\text{ V}$			—	0.1	uA
temperature coefficient		$T_a = -40^{\circ}\text{C} \sim +85^{\circ}\text{C}$		—	± 120	± 360	ppm/ $^{\circ}\text{C}$
Delay time	T_D				200	mS	

*1. $-V_{DET}$: Actual detection voltage value, $-V_{DET}(S)$: Specified detection voltage value

■ Functional Description

1. When a voltage higher than the release voltage ($+V_{DET}$) is applied to the voltage input pin (V_{DD}), the voltage will gradually fall..When a voltage higher than the detect voltage ($-V_{DET}$) is applied to V_{DD} , output (V_{OUT}) will be equal to the input at V_{DD} .

Note that high impedance exists at V_{OUT} with the N-channel open drain configuration. If the pin is pulled up, V_{OUT} will be equal to the pull up voltage.

2. When V_{DD} falls below $-V_{DET}$, V_{OUT} will be equal to the ground voltage (V_{SS}) level (detect state).

Note that this also applies to N-channel open drain configurations.

3. When V_{DD} falls to a level below that of the minimum operating voltage (V_{MIN}) output will become unstable.

Because the output pin is generally pulled up with N-channel open drain configurations, output will be equal to pull up voltage.

4. When V_{DD} rises above the V_{SS} level (excepting levels lower than minimum operating voltage), V_{OUT} will be equal to V_{SS} until V_{DD} reaches the $+V_{DET}$ level.

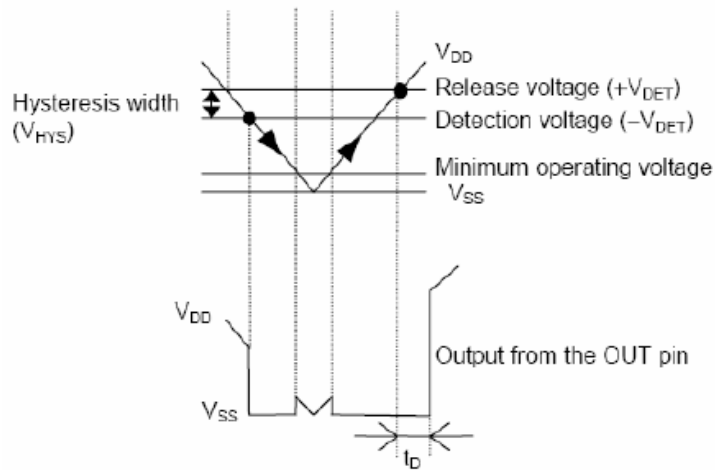
5. Although V_{DD} will rise to a level higher than $+V_{DET}$, V_{OUT} maintains ground voltage level via the delay circuit.

6. Following transient delay time, V_{DD} will be output at V_{OUT} .

Note that high impedance exists with the N-channel open drain configuration and that voltage will be dependent on pull up.

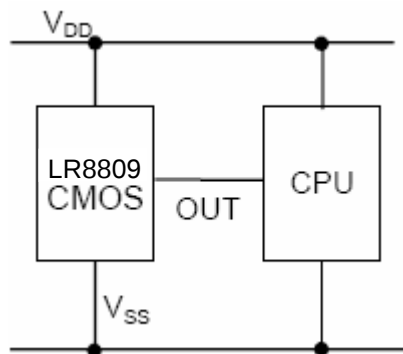
Notes :

1. The difference between $-V_{DET}$ and $+V_{DET}$ represents the hysteresis range.
2. Propagation delay time (t_D) represents the time it takes for V_{DD} to appear at V_{OUT} once the said voltage has exceeded the $+V_{DET}$ level.

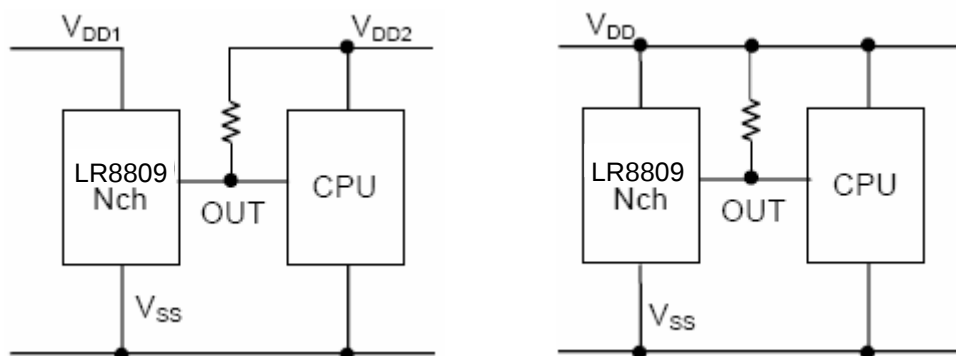


■ Standard Circuits

1、CMOS output:

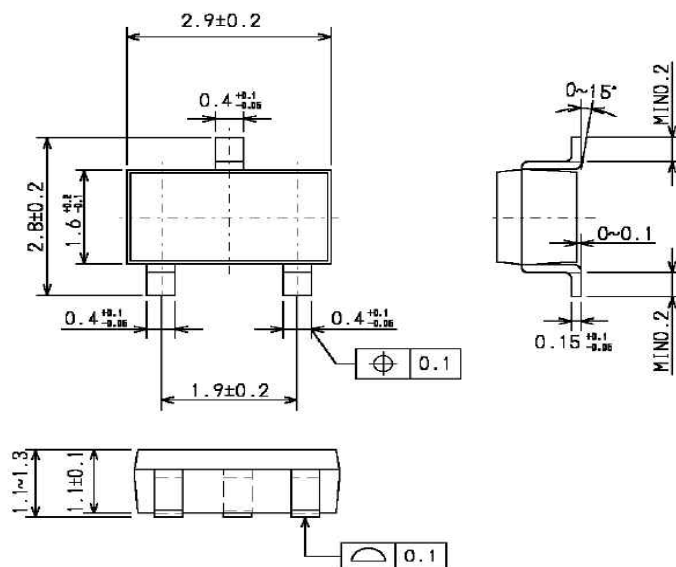


2、Nch open-drain

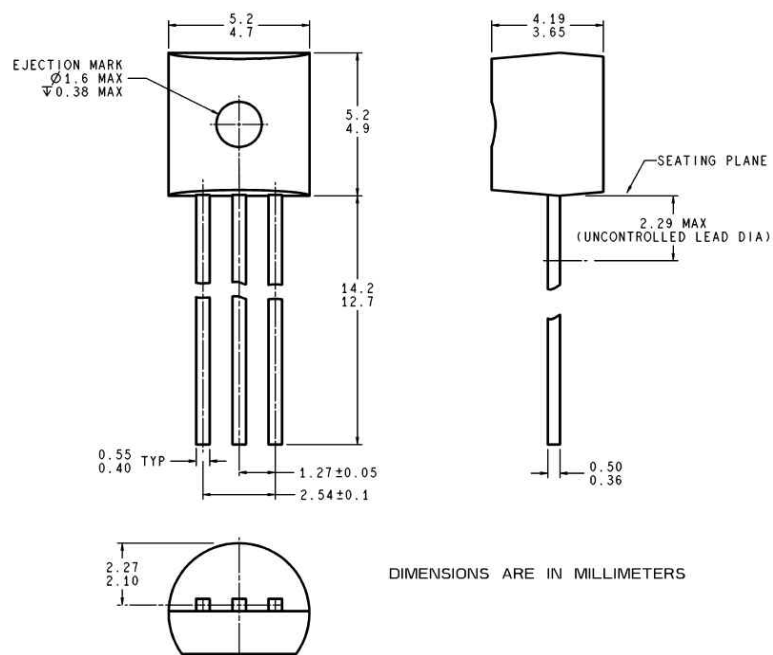


■ Package information

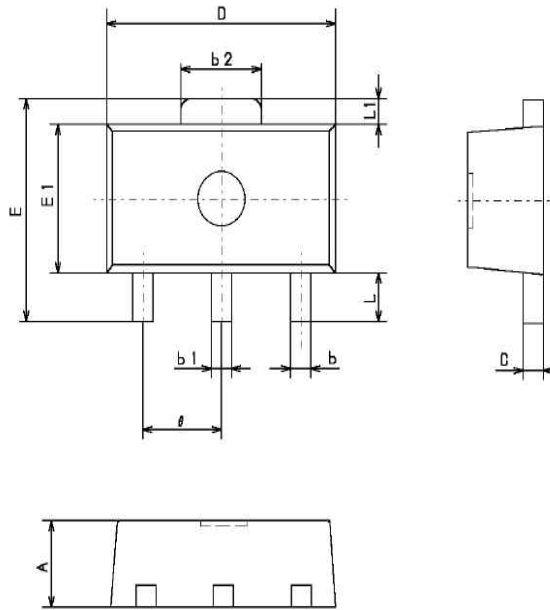
● SOT-23-3



● TO-92



● SOT-89



Symbols	Dimensions in millimeters		
	Min	Nom	Max
A	1.40	1.50	1.60
b	0.36	0.42	0.48
b1	0.41	0.47	0.53
b2	1.40	1.60	1.75
C	0.38	0.40	0.43
D	4.40	4.50	4.60
E	—	—	4.25
E1	2.40	2.50	2.60
θ	1.40	1.50	1.60
L	1.80	—	—
L1	—	0.40	—

● SOT343 (SC-82)

