



**Ultra-Small Built-In Delay
High-Precision Voltage Detector**

AF810 Series

■ **INTRODUCTION**

The AF810 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, NMOS open-drain and CMOS output are available.

■ **APPLICATIONS**

- 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**

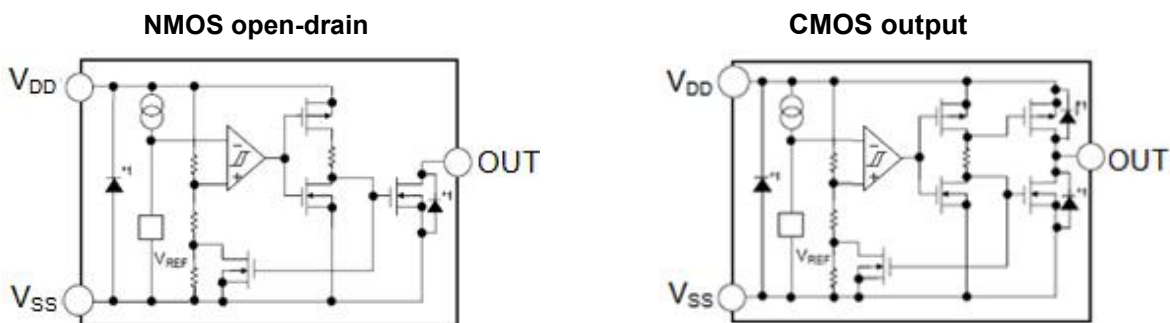
- Ultra-low current consumption: $0.9\mu A@3.5V(Typ.)$
- High-precision detection voltage: $\pm 2.0\%$
- Hysteresis characteristics: $-V_{DET} \times 5\%(Typ.)$
- Operating voltage range: 0.95V to 7.0V
- Detection voltage: 1.5V to 6.0V (10mV step)
- Delay time: 210 ms (Typ.)
- Output forms:
NMOS open-drain output (Active High)
CMOS output (Active High)

■ **ORDER INFORMATION**

AF810①②③④⑤

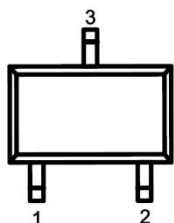
DESIGNATOR	SYMBOL	DESCRIPTION
①	C	CMOS
	N	NMOS open drain
②③④	Integer	Detection Voltage (1.50V~6.00V), “④”elide when it is “0” e.g. 3.0V=②:3, ③:0 2.93V=②:2, ③:9, ④:3
⑤	封装类型	对应字母
	Package: SOT-89	P
	Package: TO-92	T
	Package: SOT-23	N

■ BLOCK DIAGRAMS



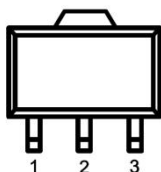
■ PIN CONFIGURATION

AF810 Series (SOT-23)



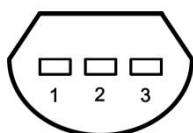
PIN NO.	N	FUNCTION
1	V _{SS}	Ground
2	V _{OUT}	Voltage detection output pin
3	V _{DD}	Voltage input pin

AF810 Series (SOT-89)



PIN NO.	P	FUNCTION
1	V _{OUT}	Voltage detection output pin
2	V _{DD}	Voltage input pin
3	V _{SS}	Ground

AF810 Series (SOT-92)



PIN NO.	T	FUNCTION
1	V _{OUT}	Voltage detection output pin
2	V _{DD}	Voltage input pin
3	V _{SS}	Ground



■ Selection Table

Part No	Detectable voltage	Package	Marking	Shipping
AF810Y-XXXZ	4.63V	SOT23	SAAA	3000/Tape & Reel
AF810Y-XXXZ	4.38V		SBAA	
AF810Y-XXXZ	4.00V		SWAA	
AF810Y-XXXZ	3.08V	SOT-89	SCAA	
AF810Y-XXXZ	2.93V	TO-92	SDAA	
AF810Y-XXXZ	2.63V		SFAA	

Note: "Y" is CMOS or NMOS output. "XXX" stand for output voltages. "Z" stands for package.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNITS
Power supply voltage		V _{DD}	V _{SS} -0.3 ~ V _{SS} +8	V
Output voltage		V _{OUT}	V _{SS} -0.3 ~ V _{SS} +8	V
Power dissipation	SOT-23	PD	400	mW
	SOT-89		600	mW
	TO-92		500	mW
Operating ambient temperature		T _{opr}	-40 ~ +85	°C
Storage temperature		T _{stg}	-40 ~ +125	°C
Soldering Temperature & Time		T _{solder}	260°C, 10s	

■ Thermal Characteristics

Symbol	Parameter	Package	Max	Units
θ _{JA}	Thermal Resistance(Junction to ambient) (Assume to ambient airflow,no heat sink)	SOT23	260	°C/W
		SOT89	150	°C/W
		TO-92	200	°C/W



■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
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}	$V_{DD} = -V_{DET} + 0.5V$	AF810 C/N20~26	—	1.0	3.0	uA
			AF810 C/N 26~39	—	1.2	3.2	uA
			AF810 C/N 39~60	—	1.5	3.5	uA
Operating voltage	V_{DD}	—		0.95	—	7	V
Output current	I_{OUT}	NMOS: $V_{OUT} = 0.5V$ $V_{DD} = -V_{DET} + 0.5V$	AF810 C/N 20~26	3.0	13.0	—	mA
			AF810 C/N 26~39	3.0	15.0	—	mA
			AF810 C/N 39~60	3.0	18.0	—	mA
		PMOS: $V_{DD} - V_{OUT} = 0.5V$ $V_{DD} = -V_{DET} - 0.5V$	AF810 C/N 20~26	1.5	4.0	—	mA
			AF810 C/N 26~39	1.5	6.0	—	mA
			AF810 C/N 39~60	1.5	8.0	—	mA
Leakage current	I_{LEAK}	Only for NMOS open-drain output products, $V_{DD} = 6.0V, V_{OUT} = 6.0V$		—	—	1.0	uA
temperature coefficient		$T_a = -40^\circ C \sim +85^\circ C$		—	± 120	± 360	ppm/ $^\circ C$
Delay time	T_{PLH}	—		130	210	290	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 ground voltage (V_{SS}).

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

2. When V_{DD} falls below $-V_{DET}$, V_{OUT} will be equal to the input at V_{DD} (detect state).

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.

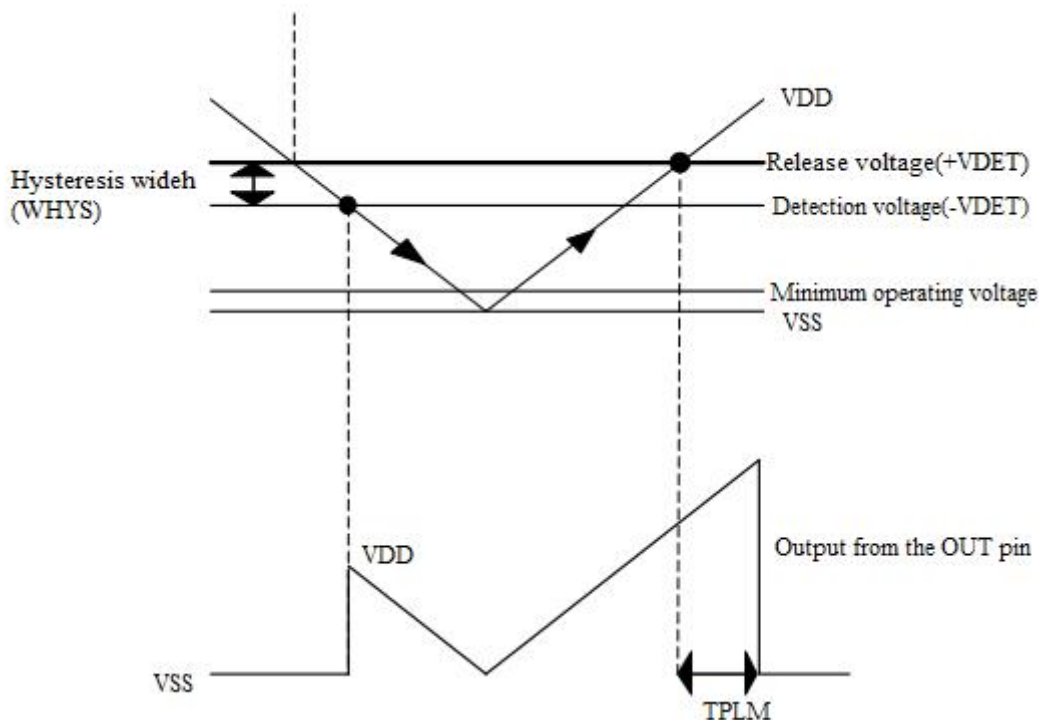
3. When V_{DD} falls to a level below that of the minimum operating voltage (V_{MIN}) output will become unstable.

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_{DD} until V_{DD} reaches the $+V_{DET}$ level.

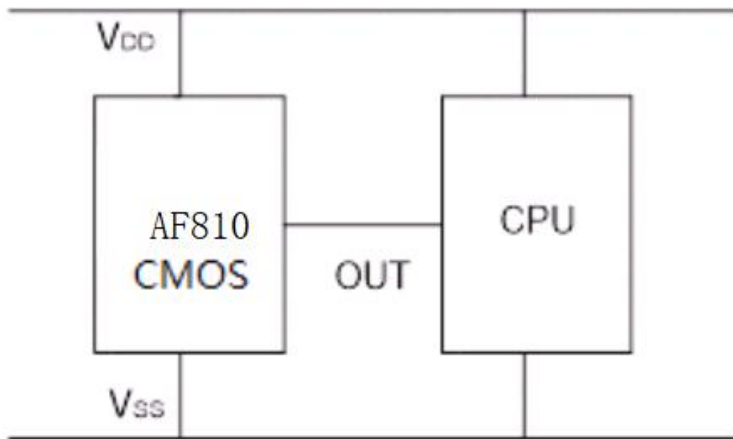
5. Although V_{DD} will rise to a level higher than $+V_{DET}$, V_{OUT} maintains V_{DD} voltage level via the delay circuit.

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

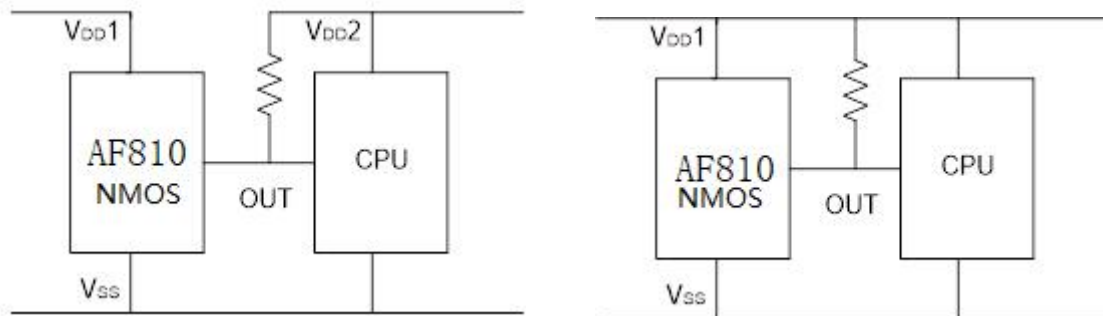


■ TYPICAL APPLICATION CIRCUITS

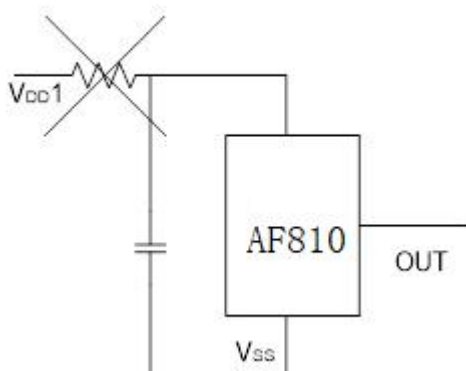
1. CMOS output:



2. NMOS open-drain

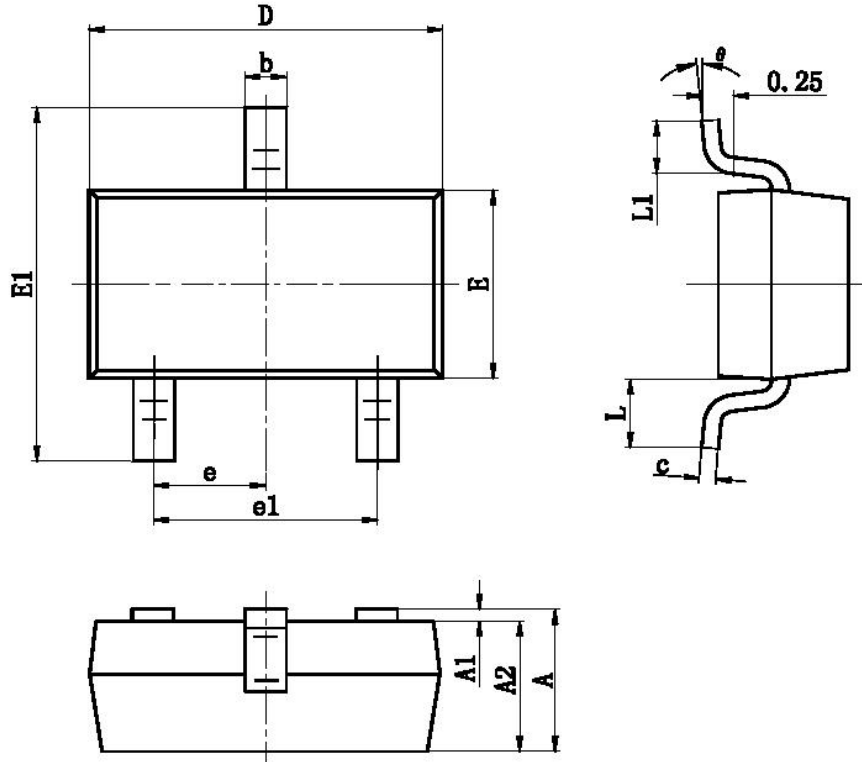


3. Forbidden Circuits



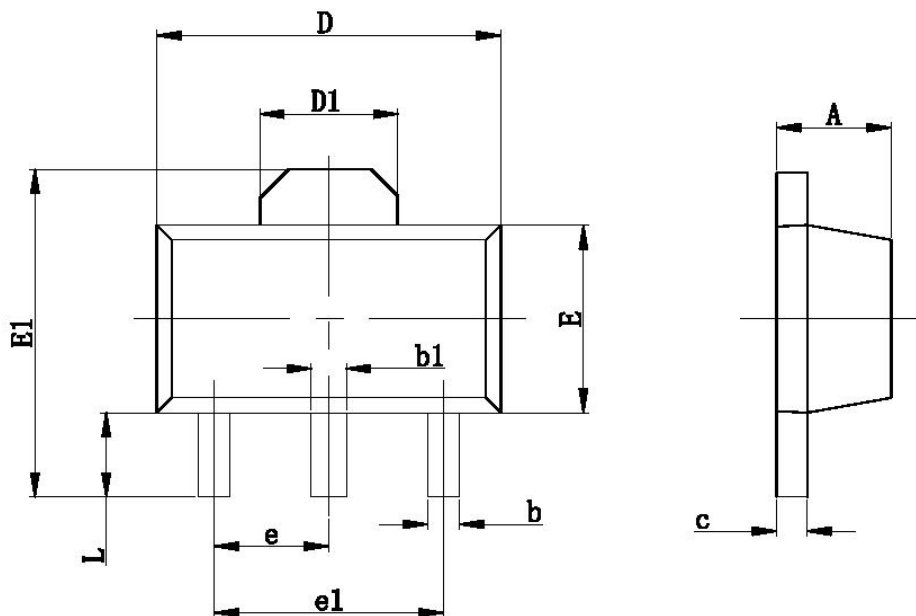
■ PACKAGING INFORMATION

- SOT-23



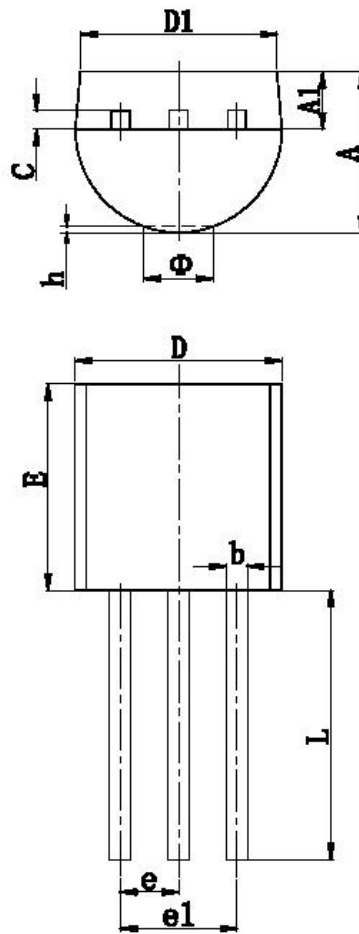
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	6°

● SOT-89



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

- TO-92



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
ϕ		1.600		0.063
h	0.000	0.380	0.000	0.015



DISCLAIMER

AFSEMI RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. AFSEMI DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICIENCE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

THE GRAPHS PROVIDED IN THIS DOCUMENT ARE STATISTICAL SUMMARIES BASED ON A LIMITED NUMBER OF SAMPLES AND ARE PROVIDED FOR INFORMATIONAL PURPOSE ONLY. THE PERFORMANCE CHARACTERISTICS LISTED IN THEM ARE NOT TESTED OR GUARANTEED. IN SOME GRAPHS, THE DATA PRESENTED MAY BE OUTSIDE THE SPECIFIED OPERATING RANGE (E.G., OUTSIDE SPECIFIED POWER SUPPLY RANGE) AND THEREFORE OUTSIDE THE WARRANTED RANGE.