

Ultra Low Power Voltage Detector

FEATURES

- Ultra-Low Quiescent Current.
- 1.5V to 10.0V Input Voltage Operation.
- Flexible Detection Voltage Setting
0.1V Step in the Range of 1.6V to 6.0V
- High Detection Voltage Accuracy at $\pm 2.5\%$.
- Built-In Detection Voltage Hysteresis.
- Three Output Types: N-ch, P-ch and CMOS.
- Space Saving Packages: TO-92, SOT-89, SOT-23 and SOT23-5.

APPLICATIONS

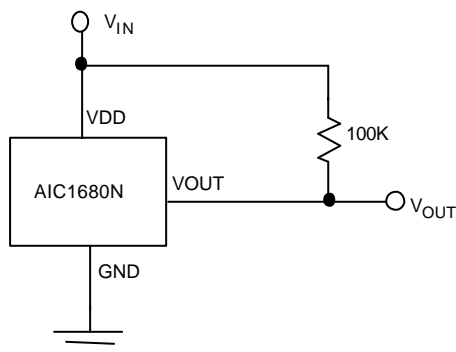
- Battery Checker for Battery-Operated Systems.
- CPU & Logic Circuit Reset.
- Memory Back-up Circuit.
- Level Discriminator.
- Power Failure Detector.

DESCRIPTION

The AIC1680 is an accurate, ultra-low power consumption voltage detector IC, fabricated with advanced CMOS process. The AIC1680 consists of a comparator, a voltage reference unit, a resistor divider, two output drivers, and a hysteresis circuit.

The consumption current is so low that it can often be ignored when compared to the battery self-discharge current. The values of detection and hysteresis voltage are set internally and are accurately controlled by trimming techniques. There are three types of output: N-ch open-drain, P-ch open-drain, and CMOS. Four types of package, TO-92, SOT-89, SOT-23 and SOT-23-5, are available to save board space.

TYPICAL APPLICATION CIRCUIT



**Voltage Level Indicator
(N-ch Open-Drain Output)**

ORDERING INFORMATION

AIC1680X-XXCXXX

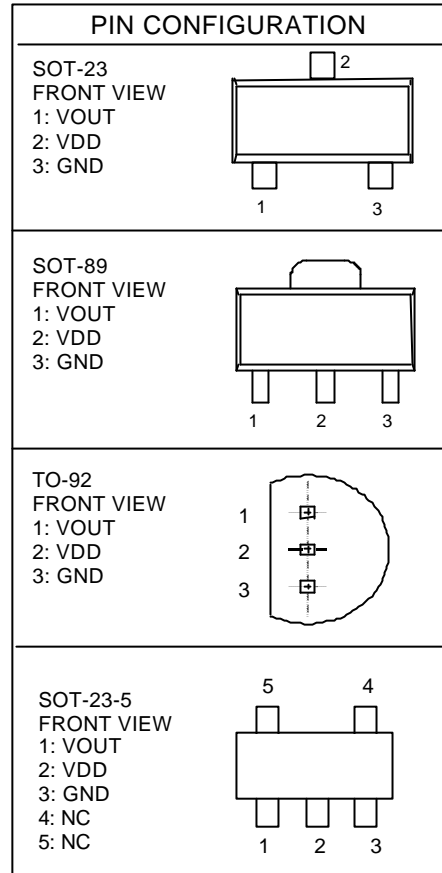
PACKING TYPE
 TR: TAPE & REEL
 TB: TUBE
 BG: BAG

PACKAGE TYPE
 U: SOT-23
 X: SOT-89
 Z: TO-92
 V: SOT-23-5

DETECTION VOLTAGE
 OPTIONAL
 16: 1.6V
 17: 1.7V
 :
 :
 60: 6.0V

OUTPUT TYPE
 N: N-ch Open Drain
 P: P-ch Open Drain
 C: CMOS

Example: AIC1680N-16CUTR
 → N-ch open drain version, in SOT-23
 Package & Tape & Reel Packing Type



ABSOLUTE MAXIMUM RATING

Supply Voltage (VDD)	10V
Output Voltage	$V_{DD}-0.3$ to 10V
Operating Temperature Range	-30°C ~ 80°C
Storage Temperature Range.....	- 65°C ~ 150°C
Lead Temperature (Soldering) 10 sec.....	260°C
Output Current	20mA

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Detector Voltage		V_{DET}	0.975	1.0	1.025	V_{DET}
Detector Threshold Hysteresis		V_{HYS}	0.03	0.05	0.07	V_{DET}
Supply Current	$V_{DD}=2.0\text{V}$ $V_{DD}=3.0\text{V}$ $V_{DD}=4.5\text{V}$ $V_{DD}=6.0\text{V}$ $V_{DD}=10.0\text{V}$	I_{DD}		0.7 0.9 1.3 1.8 3.2	1.1 1.5 2.0 2.7 4.8	μA
Operation Voltage		V_{DD}	1.5		10	V
Output Current	$V_{DS}=0.5\text{V}, V_{DD}=2.4\text{V}$ $V_{DS}=0.5\text{V}, V_{DD}=3.6\text{V}$ $V_{DS}=0.5\text{V}, V_{DD}=4.6\text{V}$ $V_{DS}=0.5\text{V}, V_{DD}=6.0\text{V}$	$I_{OUT} (\text{Nch})$		3.24 5.85 7.74 10.44		mA
Output Current	$V_{DS}=-2.1\text{V}, V_{DD}=4.5\text{V}$	$I_{OUT} (\text{Pch})$		3.5		mA
Temperature Coefficiency				± 150		ppm/ $^{\circ}\text{C}$
Output Delay Time		T_{DELAY}			200	μS

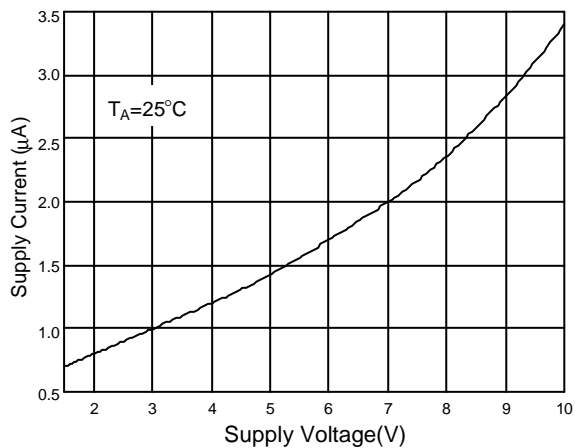
TYPICAL PERFORMANCE CHARACTERISTICS


Fig. 1 Supply Current vs. Supply Voltage

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

N-ch Driver Sinking Current vs. V_{DS}

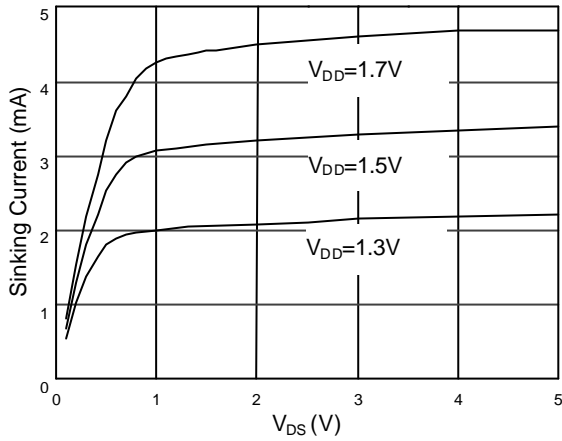


Fig. 2 $V_{DET}=1.8V$

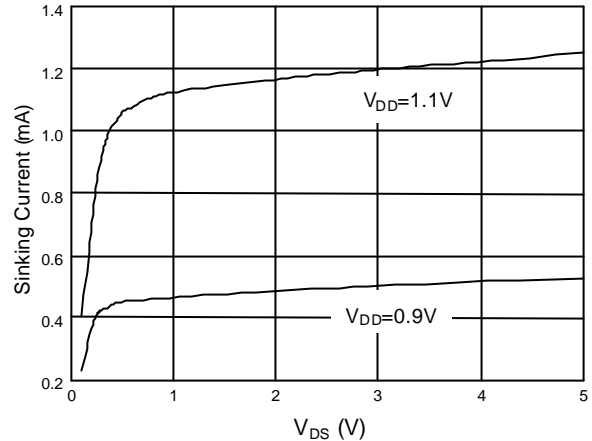


Fig. 3 $V_{DET}=1.8V$

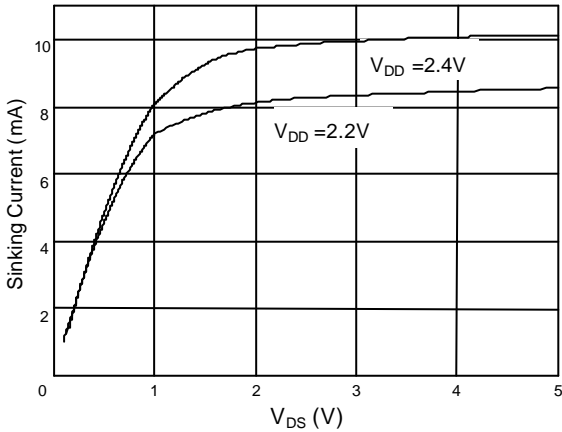


Fig. 4 $V_{DET}=2.5V$

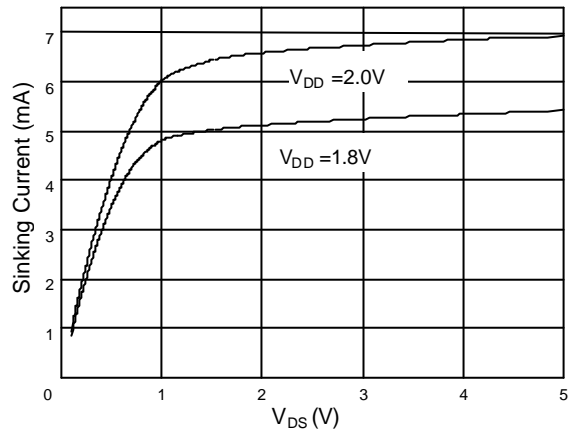


Fig. 5 $V_{DET}=2.5V$

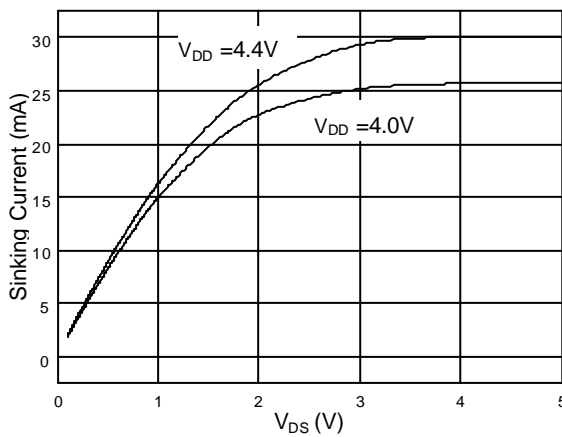


Fig. 6 $V_{DET}=4.5V$

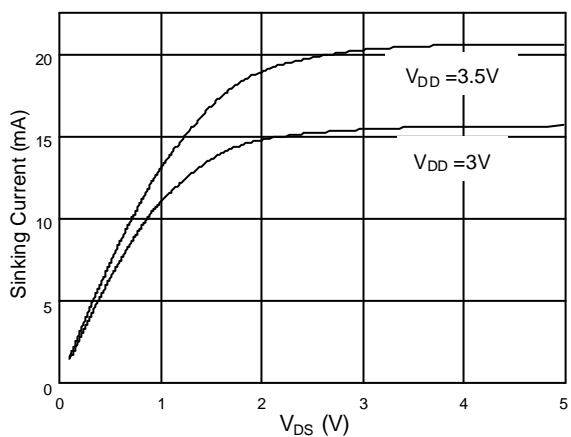


Fig. 7 $V_{DET}=4.5V$

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

P-ch Driver Output Current vs. V_{DS}

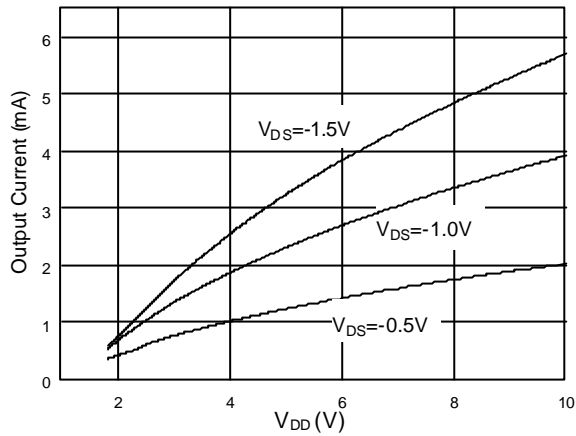


Fig. 8 $V_{DET}=1.8V$

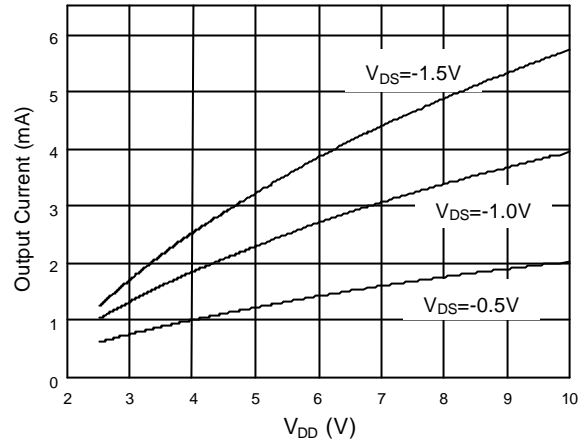


Fig. 9 $V_{DET}=2.5V$

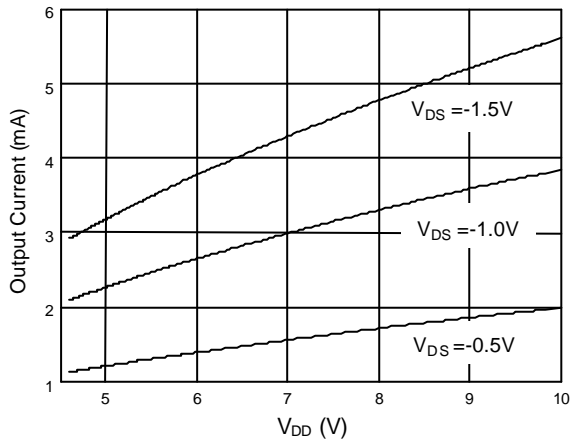
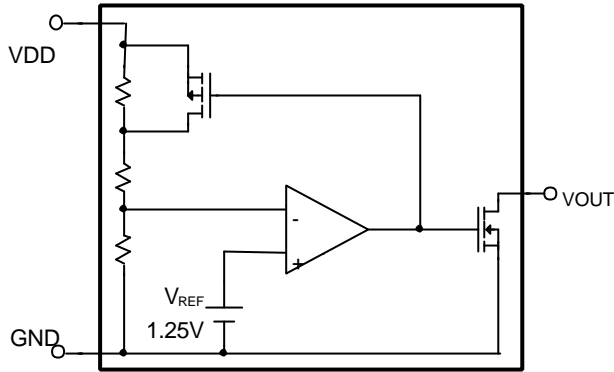
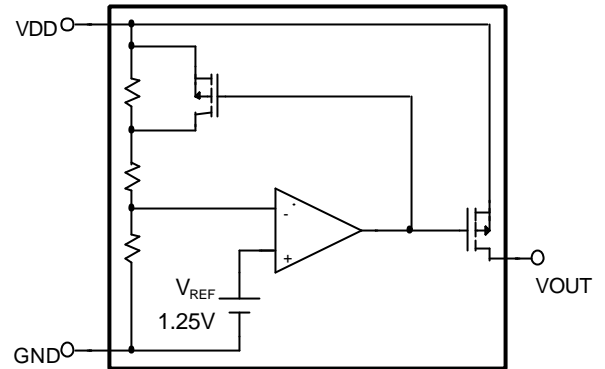


Fig. 10 $V_{DET}=4.5V$

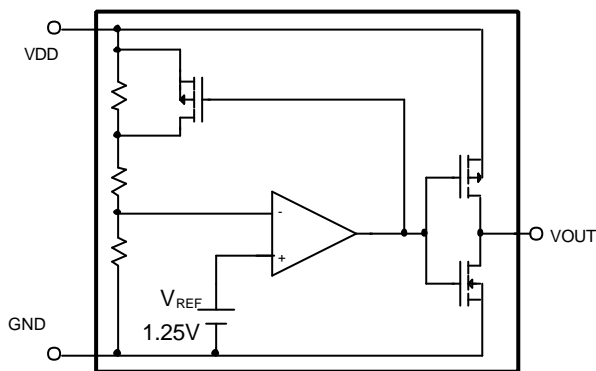
■ BLOCK DIAGRAM



N-ch open drain output



P-ch open drain output



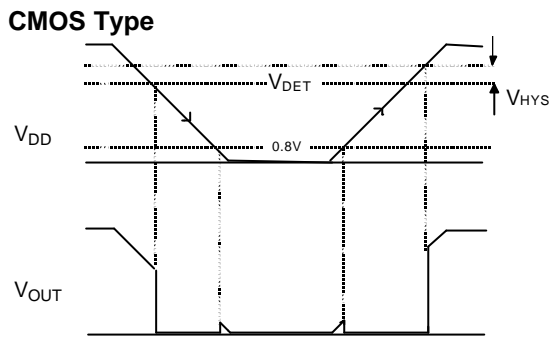
CMOS output

■ PIN DESCRIPTIONS

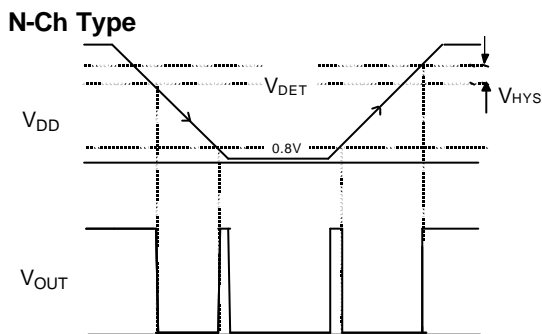
- VDD - Power Supply and Detected Voltage Input.
- GND - Ground.
- VOUT - Detector Output

■ APPLICATION INFORMATIONS

The timing diagram of V_{DD} and V_{OUT} is shown as below:

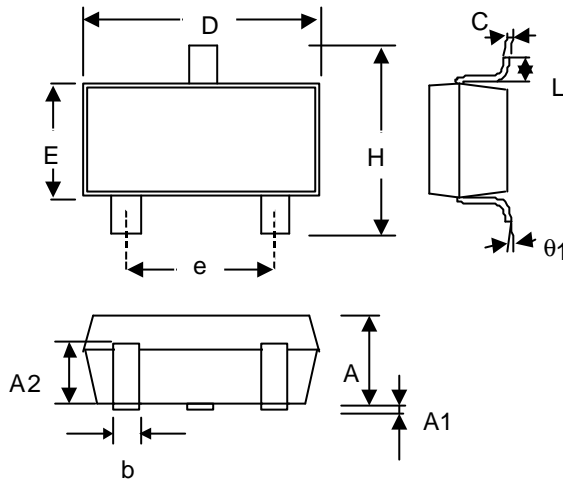


The guaranteed minimum operation voltage is 1.5V. As the supply voltage (V_{DD}) is reduced below 1.5V, the performance degrades, N-ch or P-ch driving capacity degrades, and the supply current decreases. AIC1680 isn't functioning when V_{DD} down to 0.8V.



■ PHYSICAL DIMENSIONS

● **SOT-23 (unit: mm)**



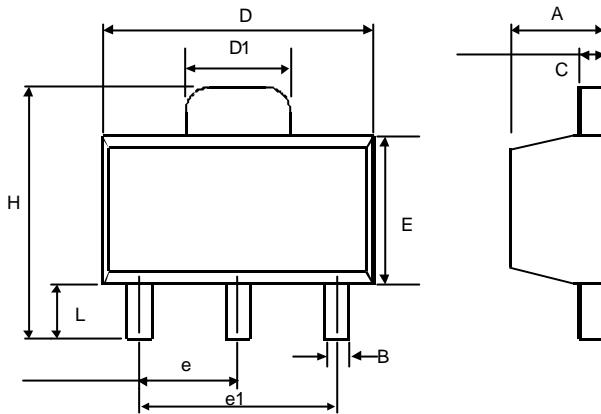
SYMBOL	MIN	MAX
A	1.00	1.30
A1	—	0.10
A2	0.70	0.90
b	0.35	0.50
C	0.10	0.25
D	2.70	3.10
E	1.40	1.80
e	1.90 (TYP)	
H	2.60	3.00
L	0.37	—
θ ₁	1°	9°

● **SOT-23 Marking**

Part No.	Marking
AIC1680-N16CU	U16N
AIC1680-P16CU	U16P
AIC1680-C16CU	U16C
AIC1680-N17CU	U17N
AIC1680-P17CU	U17P
AIC1680-C17CU	U17C
..... (0.1V INCREMENT)	

Part No.	Marking
AIC1680-N59CU	U59N
AIC1680-P59CU	U59P
AIC1680-C59CU	U59C
AIC1680-N60CU	U60N
AIC1680-P60CU	U60P
AIC1680-C60CU	U60C

● **SOT-89 (unit: mm)**



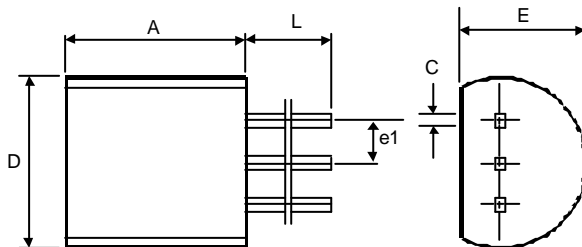
SYMBOL	MIN	MAX
A	1.40	1.60
B	0.36	0.48
C	0.35	0.44
D	4.40	4.60
D1	1.62	1.83
E	2.29	2.60
e	1.50 (TYP.)	
e1	3.00 (TYP.)	
H	3.94	4.25
L	0.89	1.20

● **SOT-89 Marking**

Part No.	Marking
AIC1680-N16CX	X16N
AIC1680-P16CX	X16P
AIC1680-C16CX	X16C
AIC1680-N17CX	X17N
AIC1680-P17CX	X17P
AIC1680-C17CX	X17C
..... (0.1V INCREMENT)	

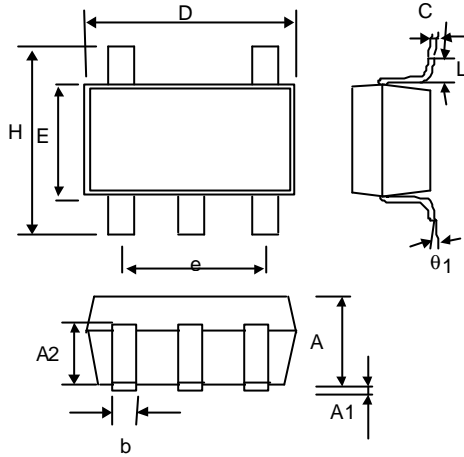
Part No.	Marking
AIC1680-N59CX	X59N
AIC1680-P59CX	X59P
AIC1680-C59CX	X59C
AIC1680-N60CX	X60N
AIC1680-P60CX	X60P
AIC1680-C60CX	X60C

● **TO-92 (unit: mm)**



SYMBOL	MIN	MAX
A	4.32	5.33
C	0.38 (TYP.)	
D	4.40	5.20
E	3.17	4.20
e1	1.27 (TYP.)	
L	12.7	-

● **SOT-23-5 (unit: mm)**



SYMBOL	MIN	MAX
A	1.00	1.30
A1	—	0.10
A2	0.70	0.90
b	0.35	0.50
C	0.10	0.25
D	2.70	3.10
E	1.40	1.80
e	1.90 (TYP)	
H	2.60	3.00
L	0.37	—
$\theta 1$	1°	9°

● **SOT-23-5 Marking**

Part No.	Marking
AIC1680-N16CV	V16N
AIC1680-P16CV	V16P
AIC1680-C16CV	V16C
AIC1680-N17CV	V17N
AIC1680-P17CV	V17P
AIC1680-C17CV	V17C
..... (0.1V INCREMENT)	

Part No.	Marking
AIC1680-N59CV	V59N
AIC1680-P59CV	V59P
AIC1680-C59CV	V59C
AIC1680-N60CV	V60N
AIC1680-P60CV	V60P
AIC1680-C60CV	V60C