AIC1680

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 ±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.
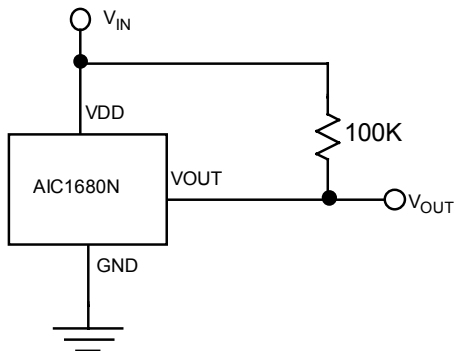
■ APPLICATIONS

- 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.
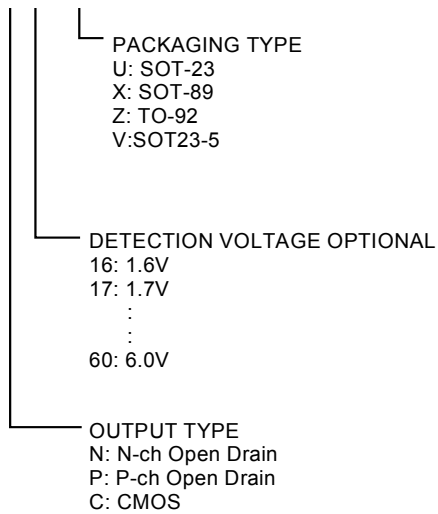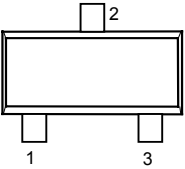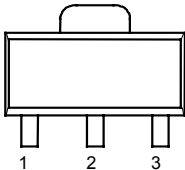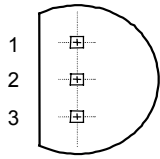
■ TYPICAL APPLICATION CIRCUIT
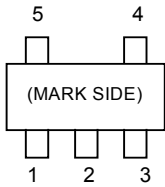
Voltage Level Indicator (N-ch Open-Drain Output)

■ ORDERING INFORMATION

AIC1680X<u>XX</u>CX

PACKAGING TYPE
U: SOT-23
X: SOT-89
Z: TO-92
V:SOT23-5

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

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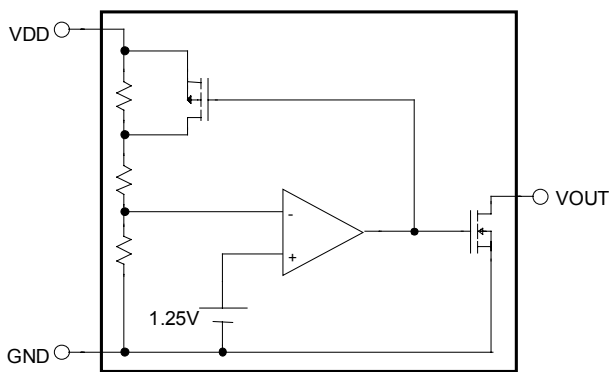P: P-ch Open Drain
C: CMOS

ORDER NUMBER	PIN CONFIGURATION
AIC1680CU (SOT-23)	FRONT VIEW 1: VOUT 2: VDD 3: GND
AIC1680CX (SOT-89)	FRONT VIEW 1: VOUT 2: VDD 3: GND
AIC1680CZ (TO-92)	FRONT VIEW 1: VOUT 2: VDD 3: GND
AIC1680CV (SOT-23-5)	FRONT VIEW 1: VOUT 2: VDD 3: GND 4: NC 5: NC (MARK SIDE)

## ■ ABSOLUTE MAXIMUM RATINS

Supply Voltage ....…...….......….…..................... 10V

Output Voltage …………..………………………………………………………..Vss-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 (Test Conditions : Ta=25°C)

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

BLOCK DIAGRAM

N-ch open drain output
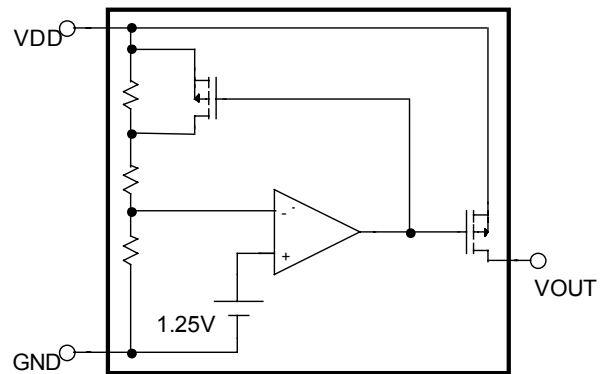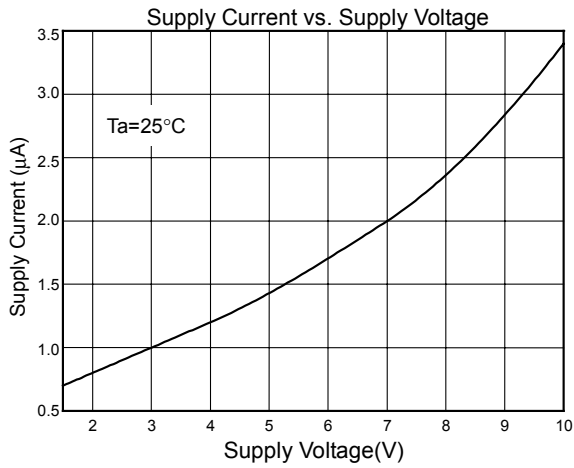

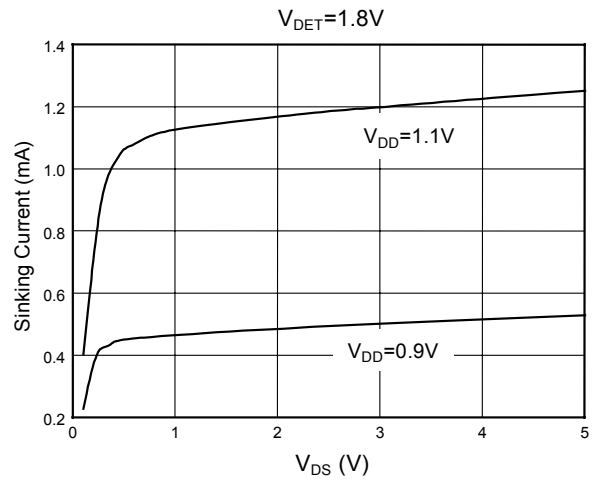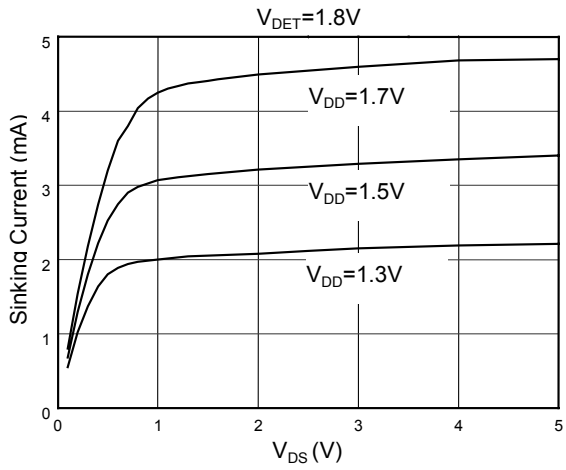P-ch open drain output
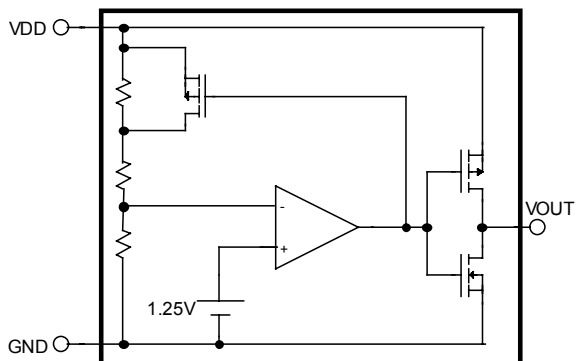
CMOS output

■ PIN DESCRIPTIONS
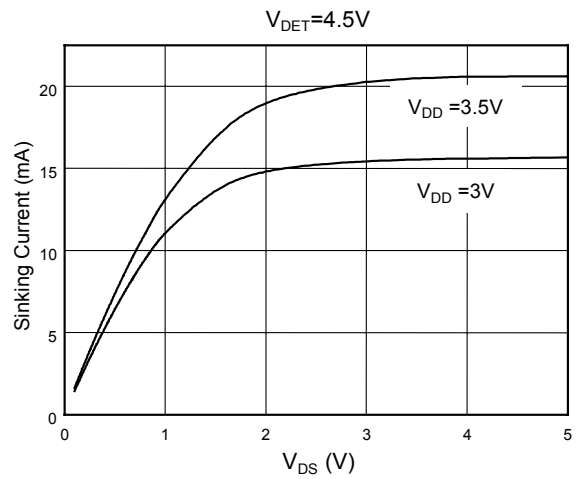
V_{DD}: Power Supply and Detected Voltage Input.

GND: Ground.

Vout: Detector Output

■ TYPICAL PERFORMANCE CHARACTERISTICS

Supply Current vs. Supply Voltage

Ta=25°C

[Graph: x-axis "Supply Voltage(V)" from 2 to 10, y-axis "Supply Current (μA)" from 0.5 to 3.5]

N-ch Driver Sinking Current vs. V$_{DS}$

V_{DET}=1.8V

[Graph: x-axis "V$_{DS}$ (V)" from 0 to 5, y-axis "Sinking Current (mA)" from 0 to 5, curves labeled V_{DD}=1.7V, V_{DD}=1.5V, V_{DD}=1.3V]

V_{DET}=1.8V

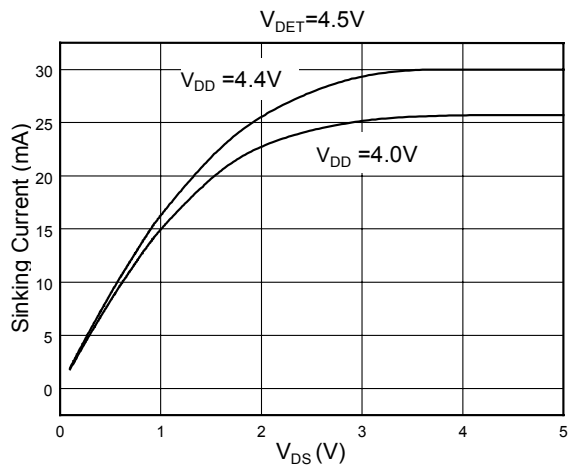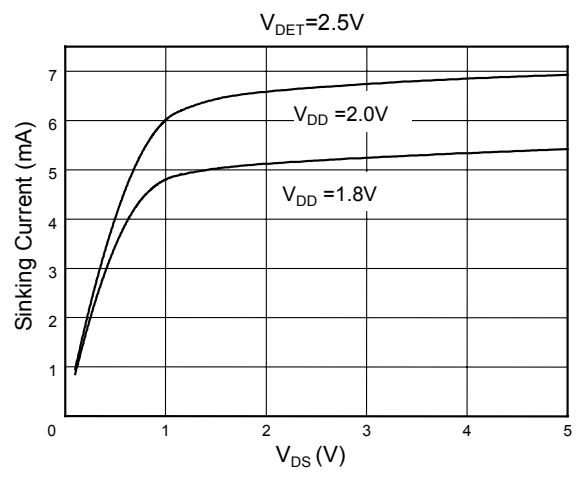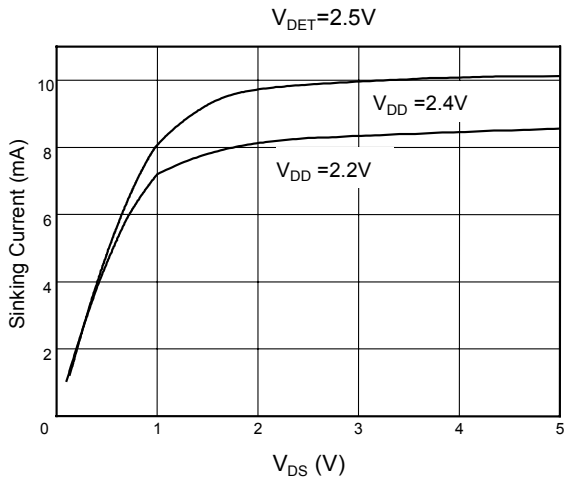[Graph: x-axis "V$_{DS}$ (V)" from 0 to 5, y-axis "Sinking Current (mA)" from 0.2 to 1.4, curves labeled V_{DD}=1.1V, V_{DD}=0.9V]

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

$V_{DET}=2.5V$

$V_{DET}=2.5V$

$V_{DET}=4.5V$

$V_{DET}=4.5V$

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

$V_{DET}=1.8V$

$V_{DET}=2.5V$

■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

V_{DET}=4.5V
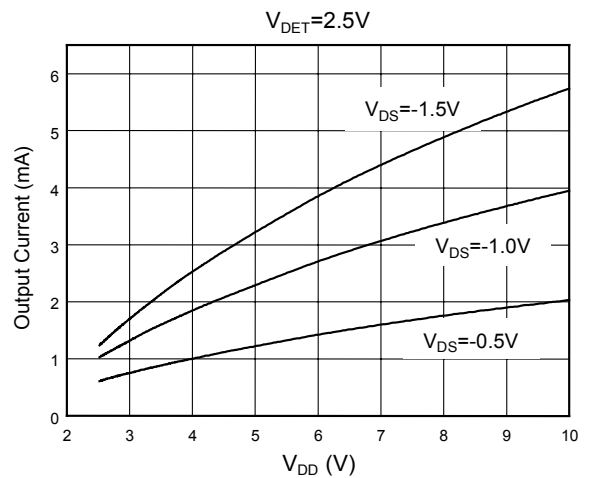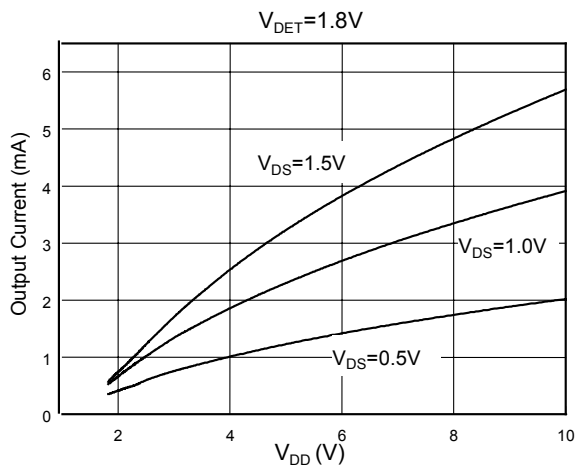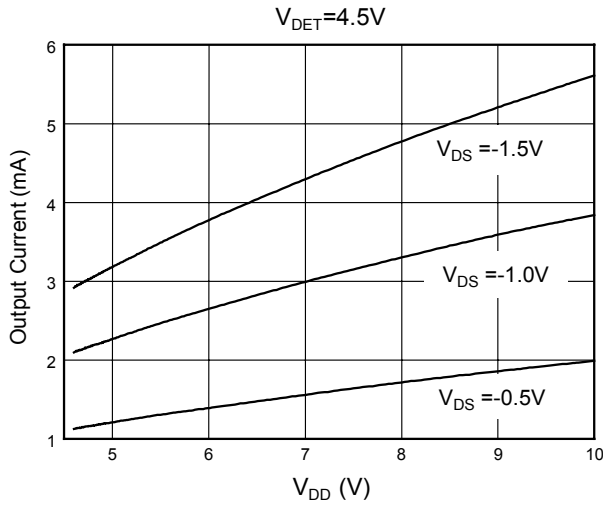
■ APPLICATION INFORMATIONS

The timing diagram of VDD and V_{OUT} is shown in below:

CMOS Type

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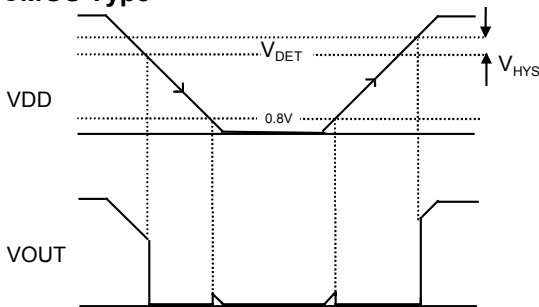
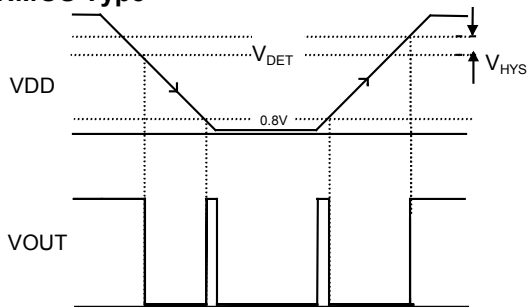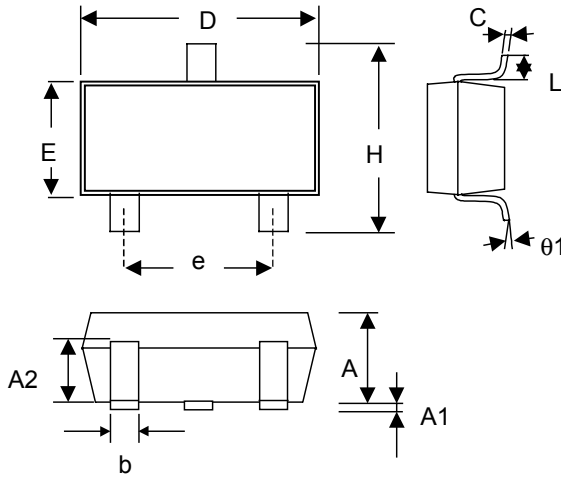The guaranteed minimun operation voltage is 1.5V. As the supply voltage(VDD) is reduced below 1.5V, the performance degrades, N-ch or P-ch driving capacity degrades, and the supply current decreases. AIC1680 isn't functioning when VDD down to 0.8V.

■ 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	—
$\theta 1$	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)**
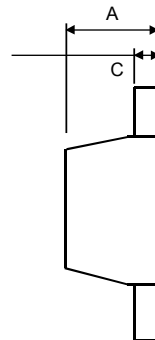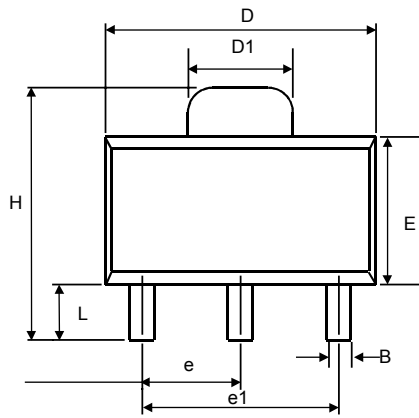
SYMBOL	MIN	MAX
A	1.40	1.60
B	0.36	0.48
C	0.35	0.44
D	4.40	4.60
D1	1.62	1.83
E	2.29	2.60
e	1.50 (TYP.)	
e1	3.00 (TYP.)	
H	3.94	4.25
L	0.89	1.20

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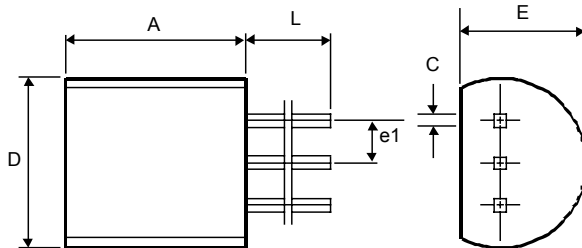
SYMBOL	MIN	MAX
A	4.32	5.33
C	0.38 (TYP.)	
D	4.40	5.20
E	3.17	4.20
e1	1.27 (TYP.)	
L	12.7	-

- **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	—
θ1	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