# 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 SS6680 is an accurate, ultra-low power consumption voltage detector IC, fabricated with advanced CMOS process. The SS6680 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
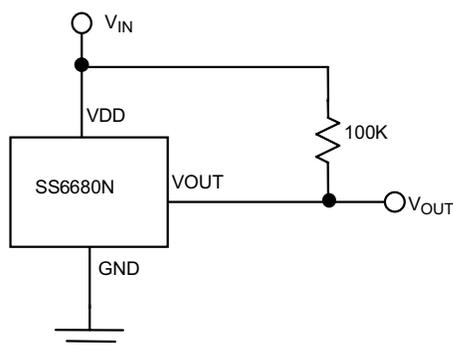


**Voltage Level Indicator**
**(N-ch Open-Drain Output)**

## ■ ORDERING INFORMATION

SS6680X-XXCXXX

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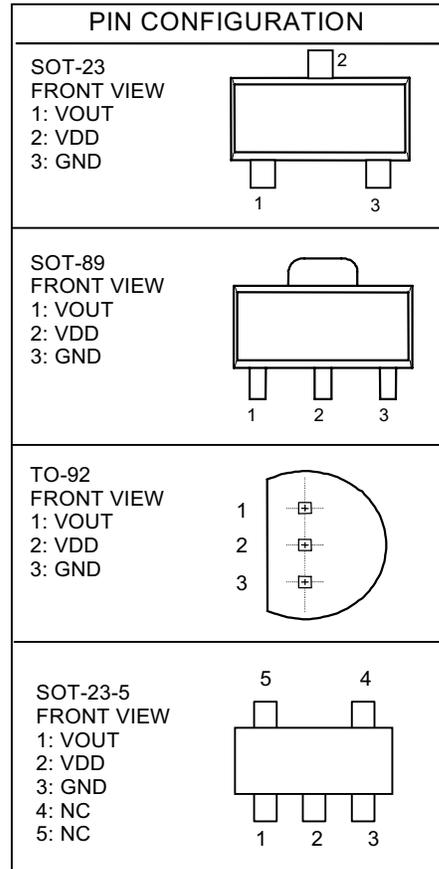TR: TAPE & REEL
TB: TUBE
BG: BAG

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: SS6680N-16CUTR**

→ N-ch open drain version, in SOT-23
Package & Tape & Reel Packing Type

| PIN CONFIGURATION |
| --- |
| SOT-23 FRONT VIEW  1: VOUT  2: VDD  3: GND |
| SOT-89 FRONT VIEW  1: VOUT  2: VDD  3: GND |
| TO-92 FRONT VIEW  1: VOUT  2: VDD  3: GND |
| SOT-23-5 FRONT VIEW  1: VOUT  2: VDD  3: GND  4: NC  5: NC |

## ■ 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 $(T_A=25^\circ C)$

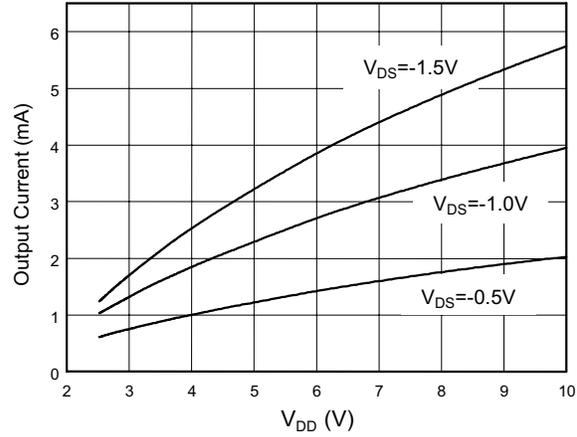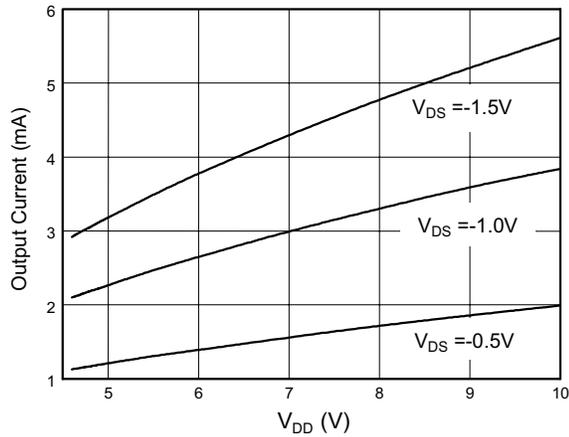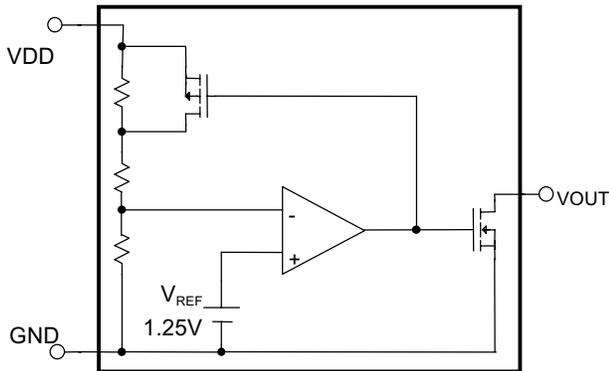| PARAMETER | TEST CONDITIONS | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Detector Voltage | | $V_{DET}$ | 0.975 | 1.0 | 1.025 | $V_{DET}$ |
| Detector Threshold Hysteresis | | $V_{HYS}$ | 0.03 | 0.05 | 0.07 | $V_{DET}$ |
| Supply Current | $V_{DD}$=2.0V | $I_{DD}$ | | 0.7 | 1.1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

## ■ TYPICAL PERFORMANCE CHARACTERISTICS
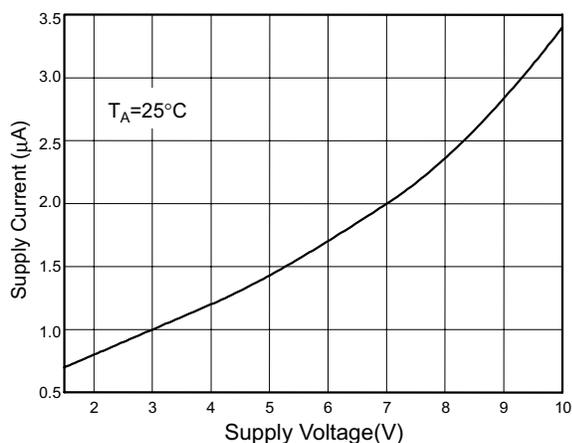


Fig. 1   Supply Current vs. Supply Voltage

# ■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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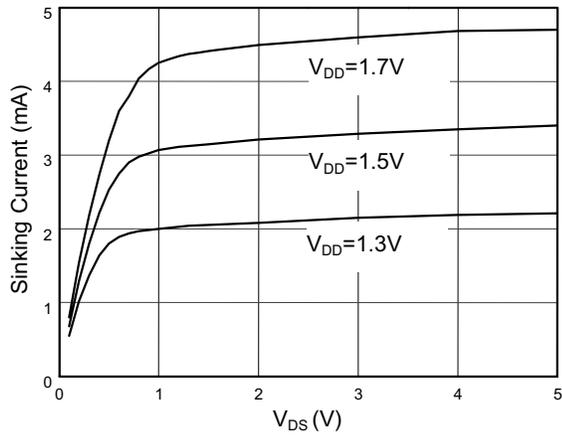


Fig. 2    $V_{DET}$=1.8V
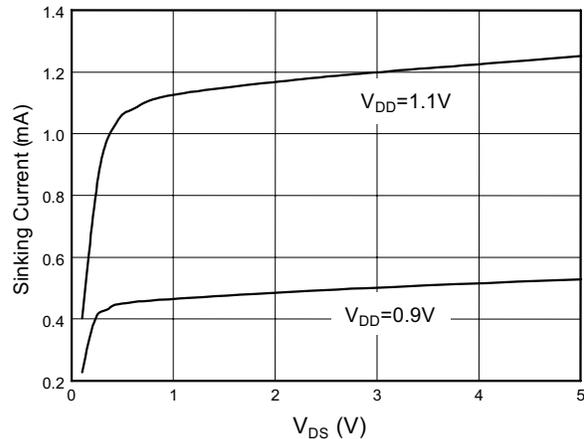


Fig. 3    $V_{DET}$=1.8V
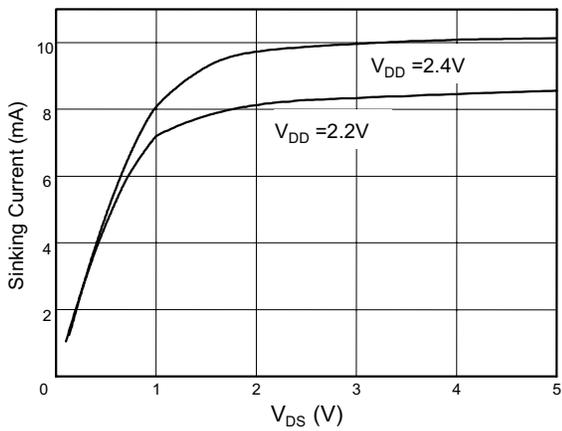


Fig. 4    $V_{DET}$=2.5V
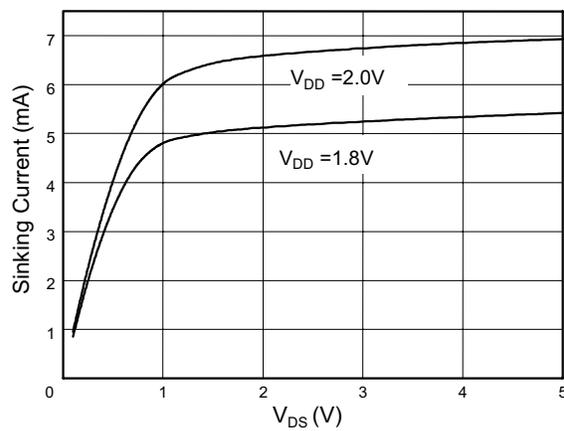


Fig. 5    $V_{DET}$=2.5V
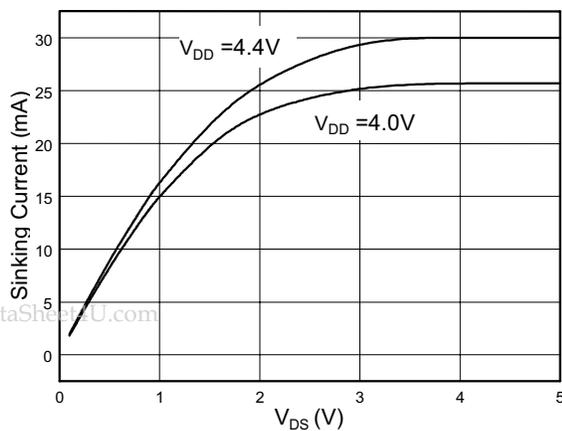


Fig. 6    $V_{DET}$=4.5V
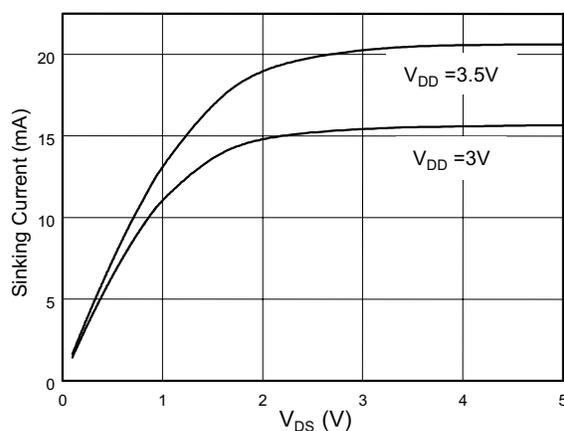


Fig. 7    $V_{DET}$=4.5V

# ■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

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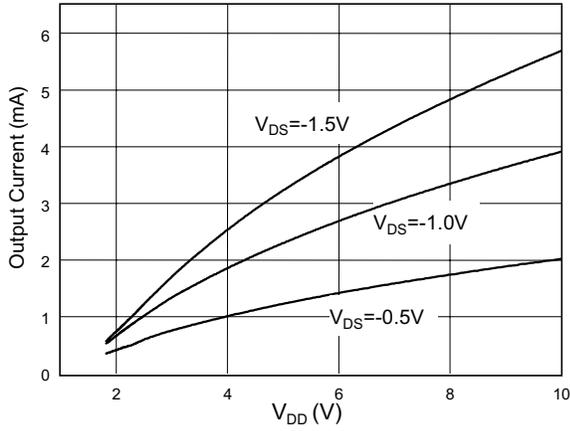


Fig. 8    $V_{DET}$=1.8V
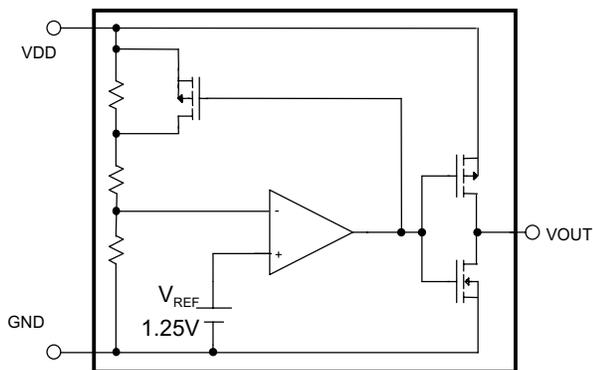


Fig. 9    $V_{DET}$=2.5V



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

# BLOCK DIAGRAM

VDD

VOUT

$V_{REF}$
1.25V

GND

N-ch open drain output

VDD

VOUT

$V_{REF}$
1.25V

GND
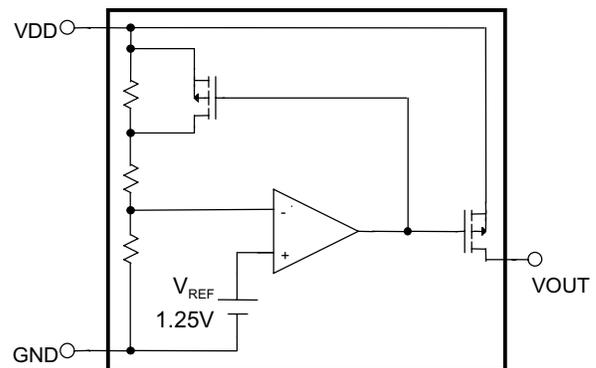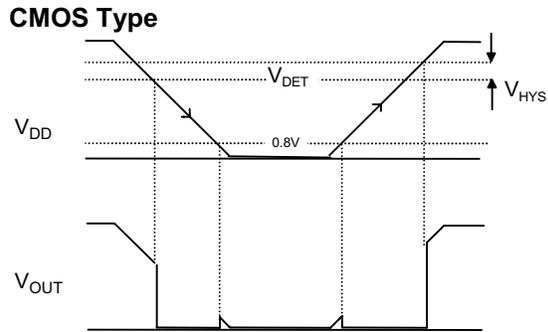
P-ch open drain output

VDD

VOUT

$V_{REF}$
1.25V

GND

CMOS output

# PIN DESCRIPTIONS

VDD   - Power Supply and Detected Voltage Input.

GND   - Ground.

VOUT  - Detector Output

# ■ APPLICATION INFORMATIONS

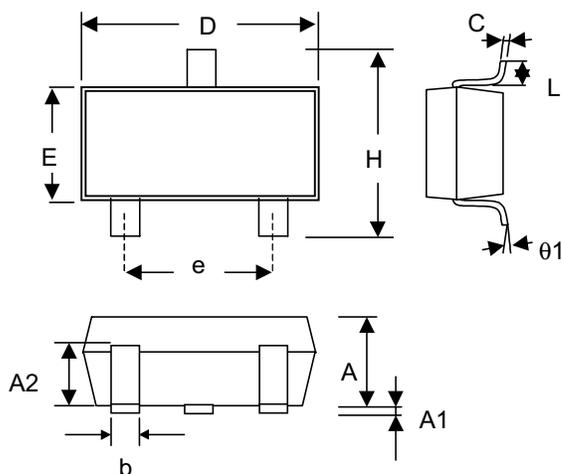The timing diagram of $V_{DD}$ and $V_{OUT}$ is shown as below:

**CMOS Type**



The guaranteed minimun 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. SS6680 isn't functioning when $V_{DD}$ down to 0.8V.

**N-Ch Type**
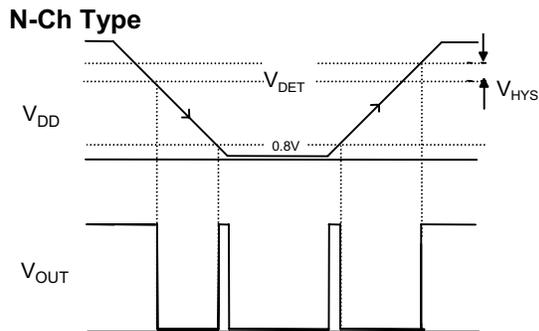
# ■ PHYSICAL DIMENSIONS

- ● **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 | — |
| θ1 | 1° | 9° |

- ● **SOT-23 Marking**

| Part No. | Marking |
|----------|---------|
| SS6680-N16CU | U16N |
| SS6680-P16CU | U16P |
| SS6680-C16CU | U16C |
| SS6680-N17CU | U17N |
| SS6680-P17CU | U17P |
| SS6680-C17CU | U17C |
| ………… (0.1V INCREMENT) | |

| Part No. | Marking |
|----------|---------|
| SS6680-N59CU | U59N |
| SS6680-P59CU | U59P |
| SS6680-C59CU | U59C |
| SS6680-N60CU | U60N |
| SS6680-P60CU | U60P |
| SS6680-C60CU | U60C |

● **SOT-89  (unit: mm)**
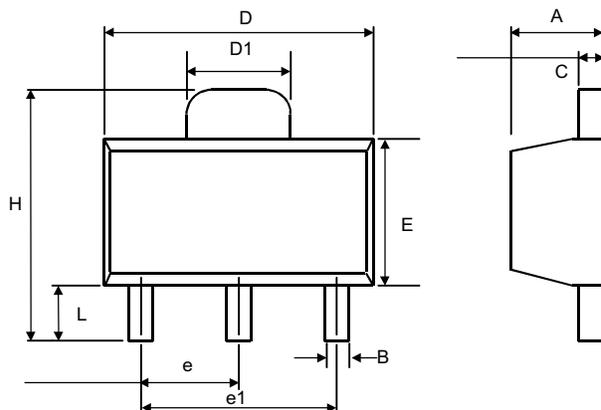
| SYMBOL | MIN | MAX |
|--------|-----|-----|
| A | 1.40 | 1.60 |
| B | 0.36 | 0.48 |
| C | 0.35 | 0.44 |
| D | 4.40 | 4.60 |
| D1 | 1.62 | 1.83 |
| E | 2.29 | 2.60 |
| e | 1.50 (TYP.) | |
| e1 | 3.00 (TYP.) | |
| H | 3.94 | 4.25 |
| L | 0.89 | 1.20 |

● **SOT-89 Marking**

| Part No. | Marking |
|----------|---------|
| SS6680-N16CX | X16N |
| SS6680-P16CX | X16P |
| SS6680-C16CX | X16C |
| SS6680-N17CX | X17N |
| SS6680-P17CX | X17P |
| SS6680-C17CX | X17C |
| ………… (0.1V INCREMENT) | |

| Part No. | Marking |
|----------|---------|
| SS6680-N59CX | X59N |
| SS6680-P59CX | X59P |
| SS6680-C59CX | X59C |
| SS6680-N60CX | X60N |
| SS6680-P60CX | X60P |
| SS6680-C60CX | X60C |

● **TO-92 (unit: mm)**
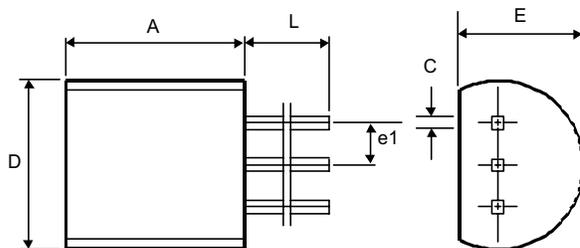
| SYMBOL | MIN | MAX |
|--------|-----|-----|
| A | 4.32 | 5.33 |
| C | 0.38 (TYP.) | |
| D | 4.40 | 5.20 |
| E | 3.17 | 4.20 |
| e1 | 1.27 (TYP.) | |
| L | 12.7 | - |

● **SOT-23-5  (unit: mm)**
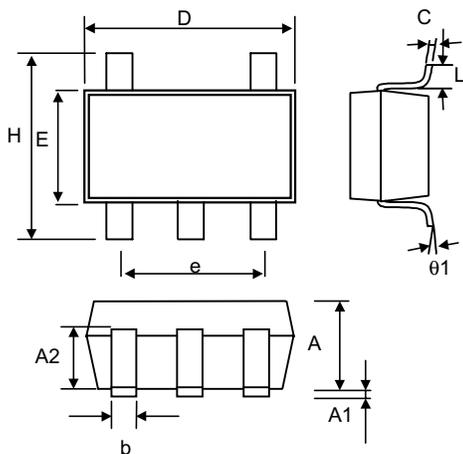
| SYMBOL | MIN | MAX |
|--------|-----|-----|
| A | 1.00 | 1.30 |
| A1 | — | 0.10 |
| A2 | 0.70 | 0.90 |
| b | 0.35 | 0.50 |
| C | 0.10 | 0.25 |
| D | 2.70 | 3.10 |
| E | 1.40 | 1.80 |
| e | 1.90 (TYP) | |
| H | 2.60 | 3.00 |
| L | 0.37 | — |
| θ1 | 1° | 9° |

● **SOT-23-5 Marking**

| Part No. | Marking |
|----------|---------|
| SS6680-N16CV | V16N |
| SS6680-P16CV | V16P |
| SS6680-C16CV | V16C |
| SS6680-N17CV | V17N |
| SS6680-P17CV | V17P |
| SS6680-C17CV | V17C |
| ………..<br>(0.1V INCREMENT) | |

| Part No. | Marking |
|----------|---------|
| SS6680-N59CV | V59N |
| SS6680-P59CV | V59P |
| SS6680-C59CV | V59C |
| SS6680-N60CV | V60N |
| SS6680-P60CV | V60P |
| SS6680-C60CV | V60C |

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