

## 2ch VOLTAGE DETECTOR

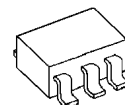
### ■ GENERAL DESCRIPTION

The NJU7712/13 is a 2ch low quiescent current voltage detector featuring high precision detection voltage.

The detection voltage is internally fixed with an accuracy of 1.0%.

NJU7712 is Nch. Open Drain and NJU7713 is a C-MOS output type.

### ■ PACKAGE OUTLINE



NJU7712/13F

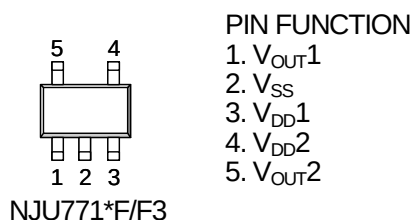


NJU7712/13F3

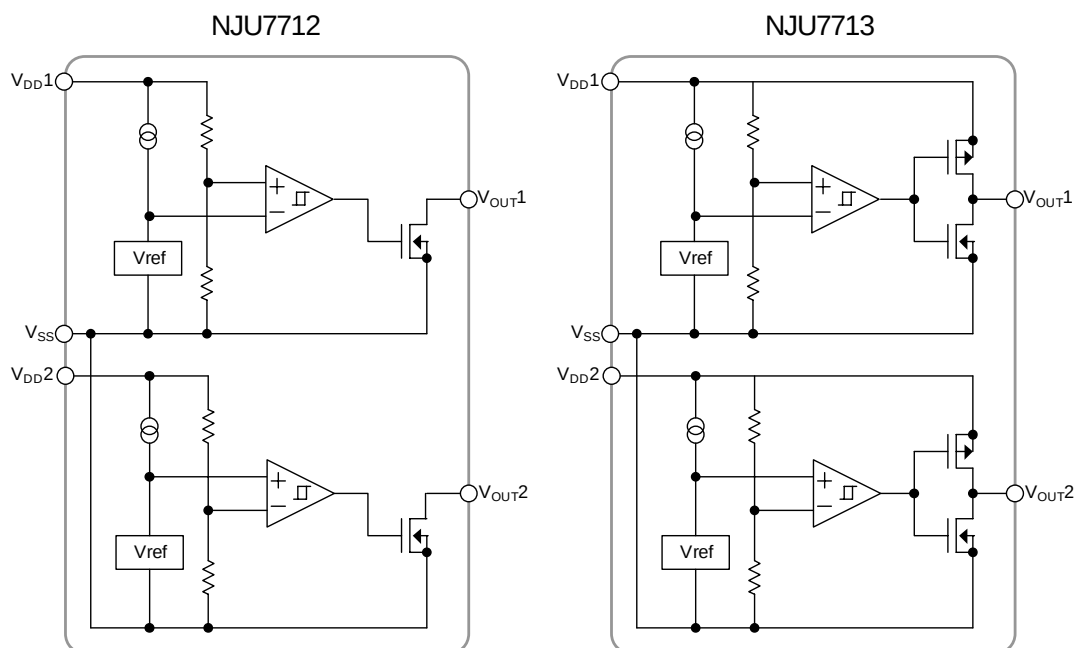
### ■ FEATURES

- High Precision detection Voltage  $\pm 1.0\%$
- Low Quiescent Current  $0.8\mu\text{A typ. (per 1ch)}$
- Detection Voltage Range  $1.5 \sim 6.0\text{V (0.1V step)}$  It applies only to 1ch(Over Voltage Detect).  
 $1.3 \sim 6.0\text{V (0.1V step)}$  It applies only to 2ch(Low Voltage Detect).
- 1ch: Over Voltage Detect, 2ch: Low Voltage Detect
- Output Configuration  
 NJU7712: Nch. Open Drain Type  
 NJU7713: C-MOS Output Type
- CMOS Technology
- Package Outline SOT-23-5 / SC88A

### ■ PIN CONFIGURATION



### ■ EQUIVALENT CIRCUIT



# NJU7712/13

## ■ DETECTION VOLTAGERANK LIST

### ●NJU7712

| Device Name    | Package  | V <sub>DET</sub> |      |
|----------------|----------|------------------|------|
|                |          | CH1              | CH2  |
| NJU7712F4227   | SOT-23-5 | 4.2V             | 2.7V |
| NJU7712F0613   |          | 6.0V             | 1.3V |
| NJU7712F3-4227 | SC88A    | 4.2V             | 2.7V |
| NJU7712F3-0613 |          | 6.0V             | 1.3V |

### ●NJU7713

| Device Name    | Package  | V <sub>DET</sub> |      |
|----------------|----------|------------------|------|
|                |          | CH1              | CH2  |
| NJU7713F0433   | SOT-23-5 | 4.0V             | 3.3V |
| NJU7713F4227   |          | 4.2V             | 2.7V |
| NJU7713F0613   |          | 6.0V             | 1.3V |
| NJU7713F3-0433 | SC88A    | 4.0V             | 3.3V |
| NJU7713F3-4227 |          | 4.2V             | 2.7V |
| NJU7713F3-0613 |          | 6.0V             | 1.3V |

## ■ NJU7712

### ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER             | SYMBOL           | RATINGS                    | UNIT    |
|-----------------------|------------------|----------------------------|---------|
| Input Voltage         | V <sub>DD</sub>  | +10                        | V       |
| Output Voltage        | V <sub>OUT</sub> | V <sub>SS</sub> -0.3 ~ +10 | V       |
| Output Current        | I <sub>OUT</sub> | 50                         | mA      |
| Power Dissipation     | P <sub>D</sub>   | SOT-23-5                   | 350(*1) |
|                       |                  |                            | 200(*2) |
|                       |                  | SC88A                      | 250(*1) |
| Operating Temperature | Topr             | -40 ~ +85                  | °C      |
| Storage Temperature   | Tstg             | -40 ~ +125                 | °C      |

(\*1) : Mounted on glass epoxy board based on EIA/JEDEC. (114.3x76.2x1.6mm: 2Layers)

(\*2) : Device itself

### ■ ELECTRICAL CHARACTERISTICS

(1ch: Over Voltage Detect, Ta=25°C)

| PARAMETER                                 | SYMBOL                  | TEST CONDITION                              | MIN.                                   | TYP.                      | MAX.                      | UNIT   |
|-------------------------------------------|-------------------------|---------------------------------------------|----------------------------------------|---------------------------|---------------------------|--------|
| Detection Voltage                         | V <sub>DET1</sub>       |                                             | -1.0%                                  | —                         | +1.0%                     | V      |
| Hysteresis Voltage                        | V <sub>HYS1</sub>       |                                             | V <sub>DET</sub><br>×0.03              | V <sub>DET</sub><br>×0.05 | V <sub>DET</sub><br>×0.08 | V      |
| Quiescent Current                         | I <sub>SS1</sub>        | V <sub>DD1</sub> =V <sub>DET1</sub> +1V     | V <sub>DET1</sub> =1.5V ~ 1.7V Version | —                         | 0.5                       | 1.0    |
|                                           |                         |                                             | V <sub>DET1</sub> =1.8V ~ 6.0V Version | —                         | 0.8                       | 1.6    |
| Output Current                            | I <sub>OUT1</sub>       | Nch, V <sub>DS1</sub> =0.5V                 | V <sub>DD1</sub> =4.8V(≤4.3V Version)  | 6                         | 13                        | —      |
|                                           |                         |                                             | V <sub>DD1</sub> =7.0V                 | 8                         | 18                        | —      |
| Output Leak Current                       | I <sub>LEAK1</sub>      | V <sub>DD1</sub> =1V, V <sub>OUT1</sub> =9V | —                                      | —                         | 0.1                       | μA     |
| Detection Voltage Temperature Coefficient | ΔV <sub>DET1</sub> /ΔTa | Ta=0 ~ +85°C                                | —                                      | ±100                      | —                         | ppm/°C |
| Operating Voltage (*3)                    | V <sub>DD1</sub>        | R <sub>L1</sub> =100kΩ                      | 0.8                                    | —                         | 9                         | V      |

(\*3): The minimum Operating Voltage(V<sub>OPL</sub>) indicates the same value of the output voltage(V<sub>OUT</sub>) on condition that V<sub>OUT</sub> becomes 90% or less of the input voltage(V<sub>DD</sub>).

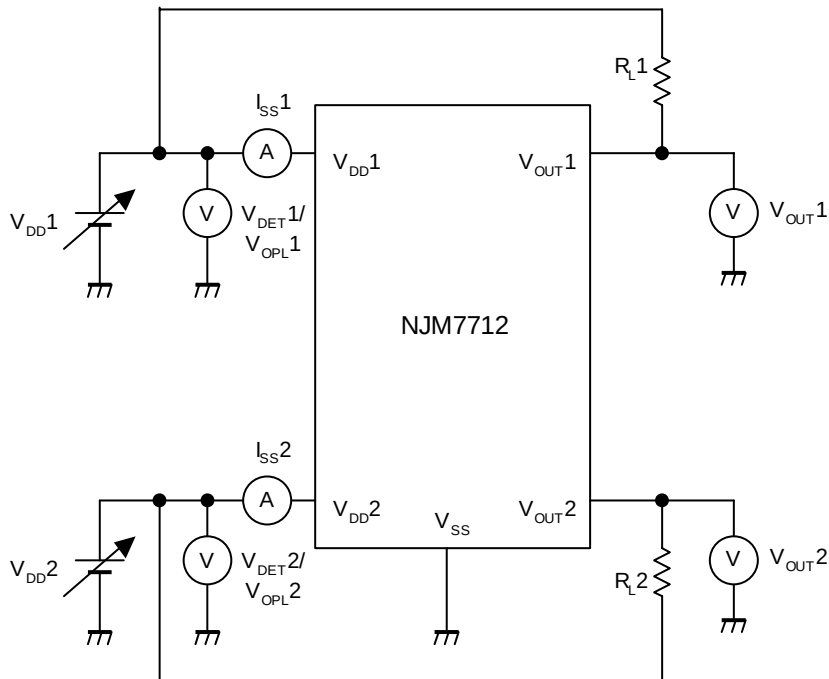
(2ch: Low Voltage Detect, Ta=25°C)

| PARAMETER                                 | SYMBOL                  | TEST CONDITION                          | MIN.                                   | TYP.                      | MAX.                      | UNIT   |
|-------------------------------------------|-------------------------|-----------------------------------------|----------------------------------------|---------------------------|---------------------------|--------|
| Detection Voltage                         | V <sub>DET2</sub>       |                                         | -1.0%                                  | —                         | +1.0%                     | V      |
| Hysteresis Voltage                        | V <sub>HYS2</sub>       |                                         | V <sub>DET</sub><br>×0.03              | V <sub>DET</sub><br>×0.05 | V <sub>DET</sub><br>×0.08 | V      |
| Quiescent Current                         | I <sub>SS2</sub>        | V <sub>DD2</sub> =V <sub>DET2</sub> +1V | V <sub>DET2</sub> =1.3V ~ 1.7V Version | —                         | 0.5                       | 1.0    |
|                                           |                         |                                         | V <sub>DET2</sub> =1.8V ~ 6.0V Version | —                         | 0.8                       | 1.6    |
| Output Current                            | I <sub>OUT2</sub>       | Nch, V <sub>DS2</sub> =0.5V             | V <sub>DD2</sub> =1.2V                 | 0.75                      | 2.0                       | —      |
|                                           |                         |                                         | V <sub>DD2</sub> =2.4V (≥2.7V Version) | 4.5                       | 7.0                       | —      |
| Output Leak Current                       | I <sub>LEAK2</sub>      | V <sub>DD2</sub> =V <sub>OUT2</sub> =9V | —                                      | —                         | 0.1                       | μA     |
| Detection Voltage Temperature Coefficient | ΔV <sub>DET2</sub> /ΔTa | Ta=0 ~ +85°C                            | —                                      | ±100                      | —                         | ppm/°C |
| Operating Voltage (*4)                    | V <sub>DD2</sub>        | R <sub>L2</sub> =100kΩ                  | 0.8                                    | —                         | 9                         | V      |

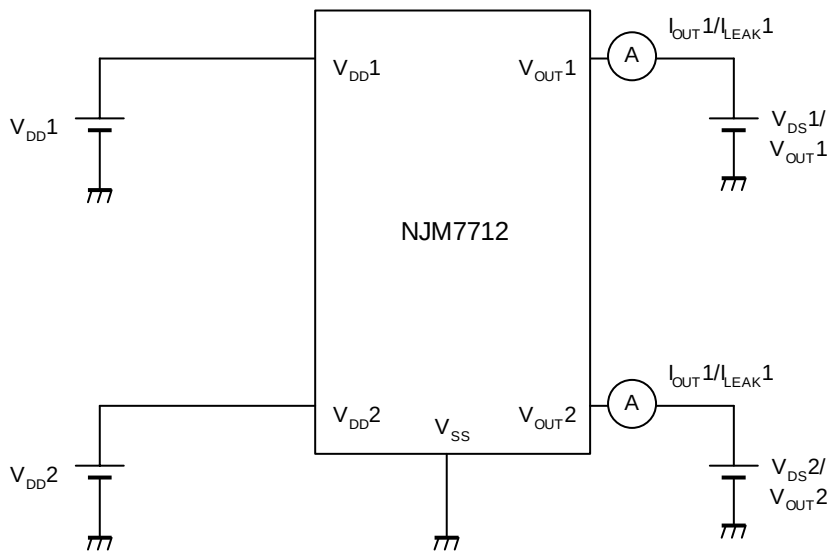
(\*4): The minimum Operating Voltage(V<sub>OPL</sub>) indicates the same value of the output voltage(V<sub>OUT</sub>) on condition that V<sub>OUT</sub> becomes 10% or less of the input voltage(V<sub>DD</sub>).

## ■ TEST CIRCUIT

### ① COMMON TEST CIRCUIT

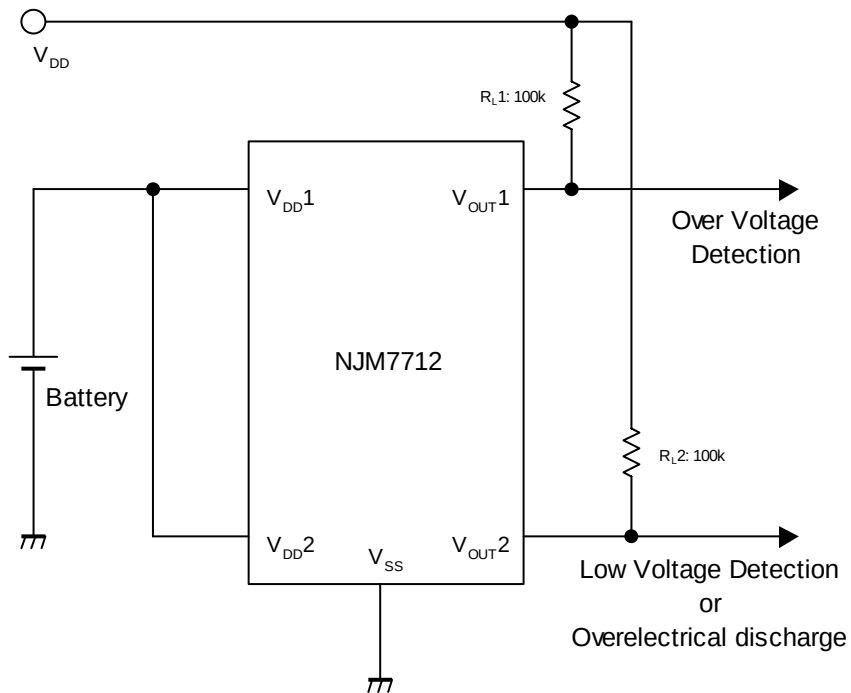


### ② OUTPUT CURRENT / LEAK CURRENT TEST CIRCUIT

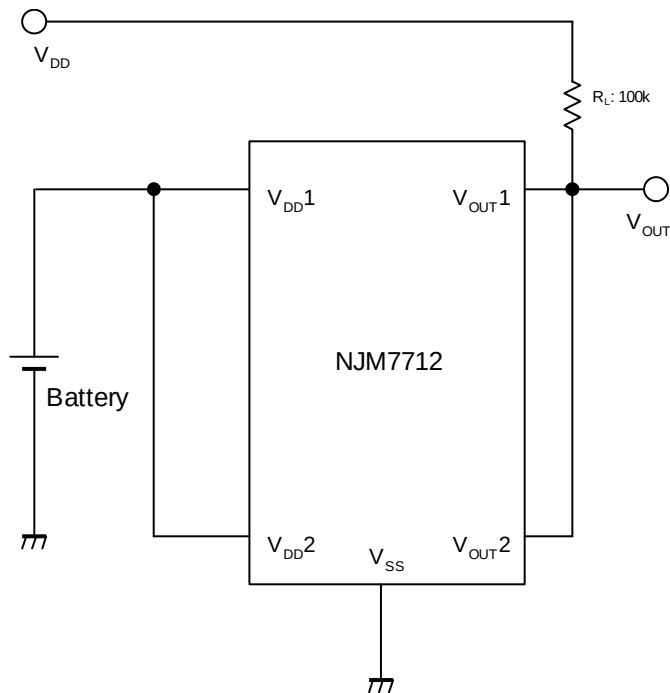


## ■ TYPICAL APPLICATION

### ① Battery voltage supervision



### ② Window Comparator



# NJU7712/13

## ■ NJU7713

### ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER             | SYMBOL    | RATINGS               | UNIT    |
|-----------------------|-----------|-----------------------|---------|
| Input Voltage         | $V_{DD}$  | +10                   | V       |
| Output Voltage        | $V_{OUT}$ | $V_{SS}-0.3 \sim +10$ | V       |
| Output Current        | $I_{OUT}$ | 50                    | mA      |
| Power Dissipation     | $P_D$     | SOT-23-5              | 350(*5) |
|                       |           |                       | 200(*6) |
|                       |           | SC88A                 | 250(*5) |
| Operating Temperature | $T_{opr}$ | -40 ~ +85             | °C      |
| Storage Temperature   | $T_{stg}$ | -40 ~ +125            | °C      |

(\*5) : Mounted on glass epoxy board based on EIA/JEDEC. (114.3x76.2x1.6mm: 2Layers)

(\*6) : Device itself

### ■ ELECTRICAL CHARACTERISTICS

(1ch: Over Voltage Detect, Ta=25°C)

| PARAMETER                                 | SYMBOL                       | TEST CONDITION           | MIN.                              | TYP.                  | MAX.                  | UNIT   |
|-------------------------------------------|------------------------------|--------------------------|-----------------------------------|-----------------------|-----------------------|--------|
| Detection Voltage                         | $V_{DET1}$                   |                          | -1.0%                             | —                     | +1.0%                 | V      |
| Hysteresis Voltage                        | $V_{HYS1}$                   |                          | $V_{DET} \times 0.03$             | $V_{DET} \times 0.05$ | $V_{DET} \times 0.08$ | V      |
| Quiescent Current                         | $I_{SS1}$                    | $V_{DD1}=V_{DET1}+1V$    | $V_{DET1}=1.5V \sim 1.7V$ Version | 0.5                   | 1.0                   | μA     |
|                                           |                              |                          | $V_{DET1}=1.8V \sim 6.0V$ Version | 0.8                   | 1.6                   | μA     |
| Output Current                            | $I_{OUT1}$                   | Nch, $V_{DS1}=0.5V$      | $V_{DD1}=4.8V(\leq 4.3V$ Version) | 6                     | 13                    | mA     |
|                                           |                              |                          | $V_{DD1}=7.0V$                    | 8                     | 18                    | mA     |
|                                           |                              | Pch, $V_{DS1}=0.5V$      | $V_{DD1}=1.4V$                    | 0.1                   | 0.4                   | mA     |
|                                           |                              |                          | $V_{DD1}=2.4V(\geq 2.7V$ Version) | 0.6                   | 1.6                   | mA     |
| Detection Voltage Temperature Coefficient | $\Delta V_{DET1}/\Delta T_a$ | $T_a=0 \sim +85^\circ C$ | —                                 | ±100                  | —                     | ppm/°C |
| Operating Voltage (*7)                    | $V_{DD1}$                    | $R_L1=100k\Omega$        | 1.2                               | —                     | 9                     | V      |

(\*7): The minimum Operating Voltage( $V_{OPL}$ ) indicates the same value of the output voltage( $V_{OUT}$ ) on condition that  $V_{OUT}$  becomes 90% or less of the input voltage( $V_{DD}$ ).

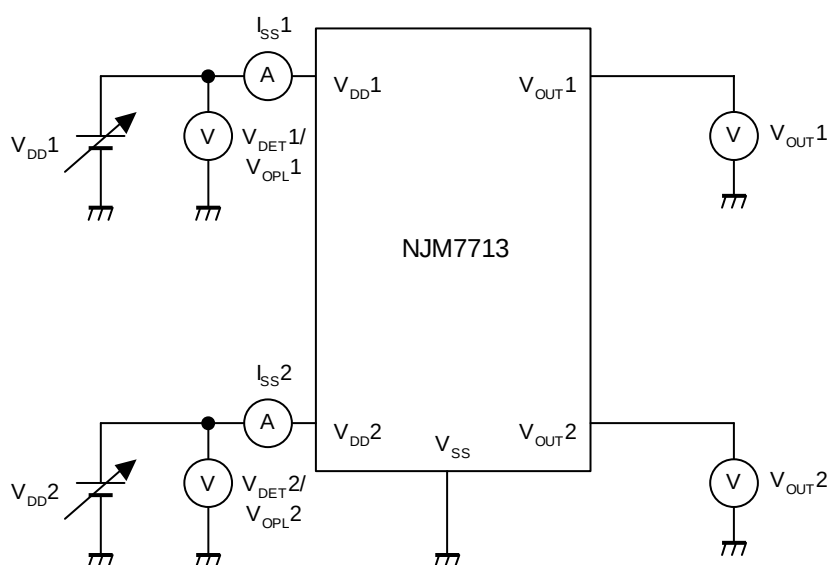
(2ch: Low Voltage detect, Ta=25°C)

| PARAMETER                                 | SYMBOL                       | TEST CONDITION           | MIN.                               | TYP.                  | MAX.                  | UNIT   |
|-------------------------------------------|------------------------------|--------------------------|------------------------------------|-----------------------|-----------------------|--------|
| Detection Voltage                         | $V_{DET2}$                   |                          | -1.0%                              | —                     | +1.0%                 | V      |
| Hysteresis Voltage                        | $V_{HYS2}$                   |                          | $V_{DET} \times 0.03$              | $V_{DET} \times 0.05$ | $V_{DET} \times 0.08$ | V      |
| Quiescent Current                         | $I_{SS2}$                    | $V_{DD2}=V_{DET2}+1V$    | $V_{DET2}=1.3V \sim 1.7V$ Version  | 0.5                   | 1.0                   | μA     |
|                                           |                              |                          | $V_{DET2}=1.8V \sim 6.0V$ Version  | 0.8                   | 1.6                   | μA     |
| Output Current                            | $I_{OUT2}$                   | Nch, $V_{DS2}=0.5V$      | $V_{DD2}=4.8V(\leq 4.3V$ Version)  | 0.75                  | 2.0                   | mA     |
|                                           |                              |                          | $V_{DD2}=7.0V$                     | 4.5                   | 7.0                   | mA     |
|                                           |                              | Pch, $V_{DS2}=0.5V$      | $V_{DD2}=1.4V$                     | 2.0                   | 3.5                   | mA     |
|                                           |                              |                          | $V_{DD2}=2.4V$ (4.0V~5.6V Version) | 2.5                   | 4.0                   | mA     |
|                                           |                              |                          | $V_{DD2}=8.4V (\geq 5.7V$ Version) | 3.0                   | 5.0                   | mA     |
|                                           |                              |                          |                                    |                       |                       |        |
| Detection Voltage Temperature Coefficient | $\Delta V_{DET2}/\Delta T_a$ | $T_a=0 \sim +85^\circ C$ | —                                  | ±100                  | —                     | ppm/°C |
| Operating Voltage (*8)                    | $V_{DD2}$                    | $R_L2=100k\Omega$        | 0.8                                | —                     | 9                     | V      |

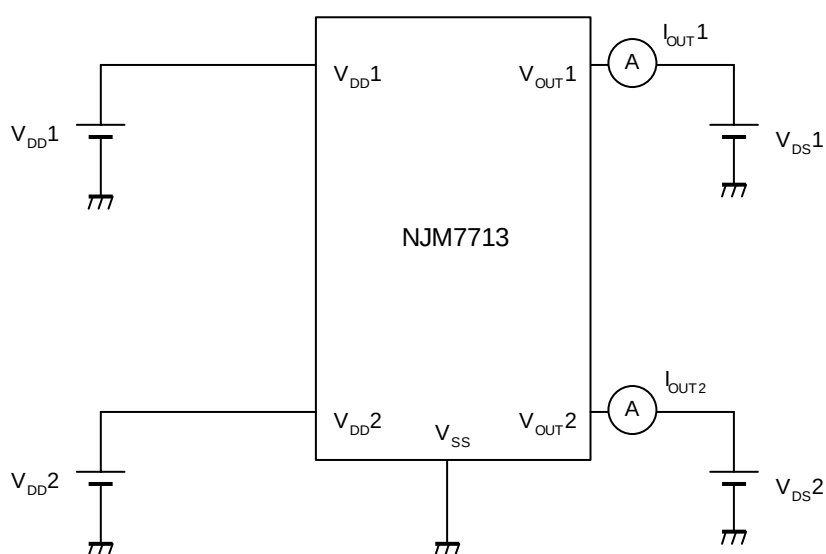
(\*8): The minimum Operating Voltage( $V_{OPL}$ ) indicates the same value of the output voltage( $V_{OUT}$ ) on condition that  $V_{OUT}$  becomes 10% or less of the input voltage( $V_{DD}$ ).

## ■ TEST CIRCUIT

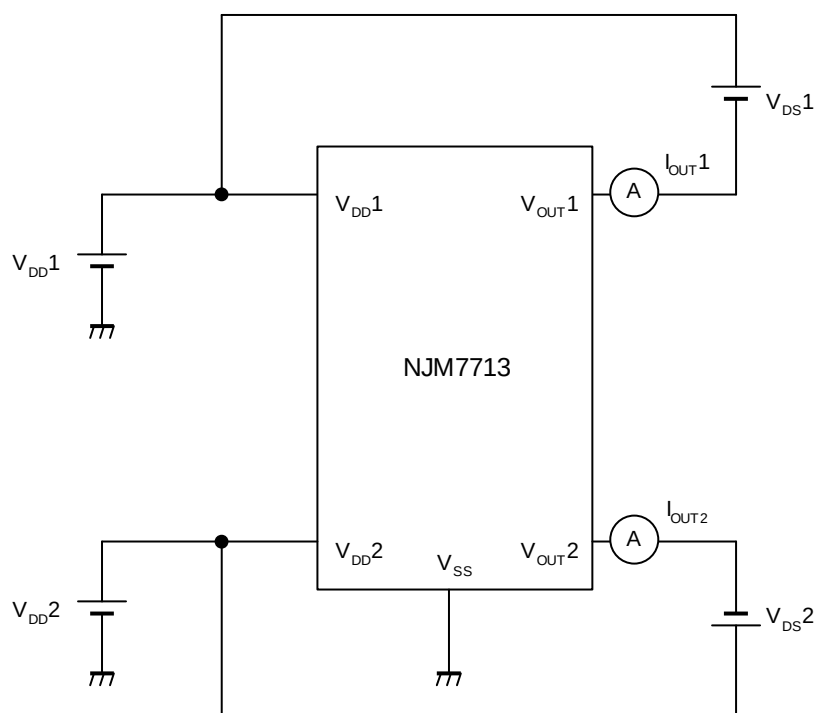
### ① COMMON TEST CIRCUIT



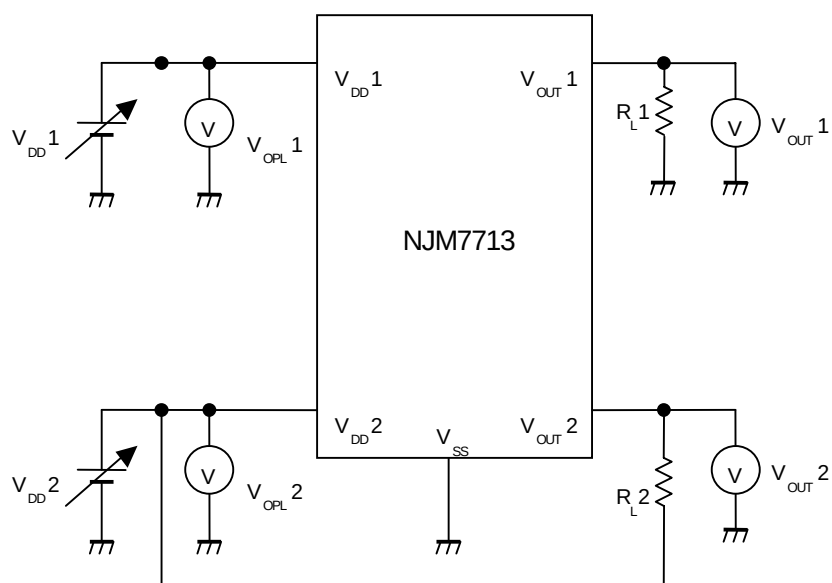
### ② Nch OUTPUT CURRENT TEST CIRCUIT



## ③ Pch OUTPUT CURRENT TEST CIRCUIT



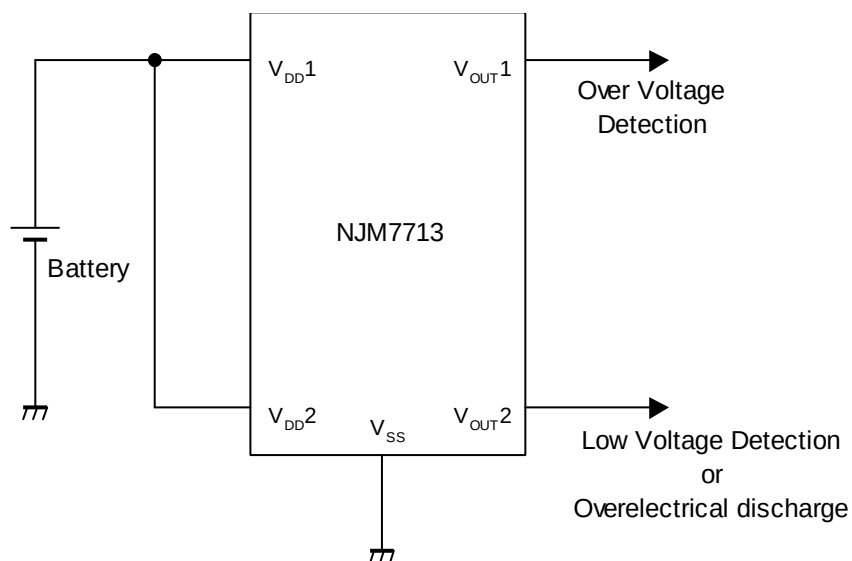
## ④ MINIMUM OPERATING VOLTAGE TEST CIRCUIT





## ■ TYPICAL APPLICATION

### ① Battery voltage supervision



#### [CAUTION]

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