

## CMOS Logic

### DESCRIPTION

XC74UL4066 is CMOS analog switch manufactured using silicon gate CMOS processes. The small supply current, which is one of the features of the CMOS logic, gives way to high speed analog or digital signal switching. As the series is integrated into a mini molded, SSOT-25 and SON-6 package, high density mounting is possible.

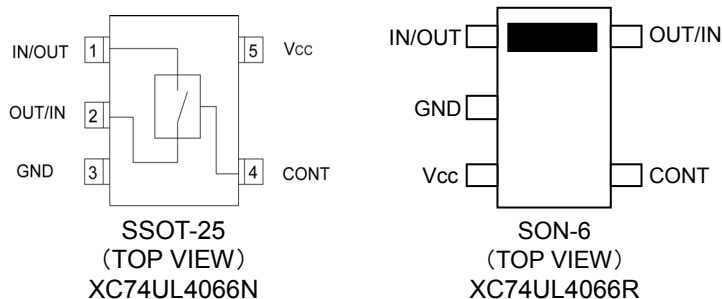
### APPLICATIONS

- Palmtops
- Digital equipment

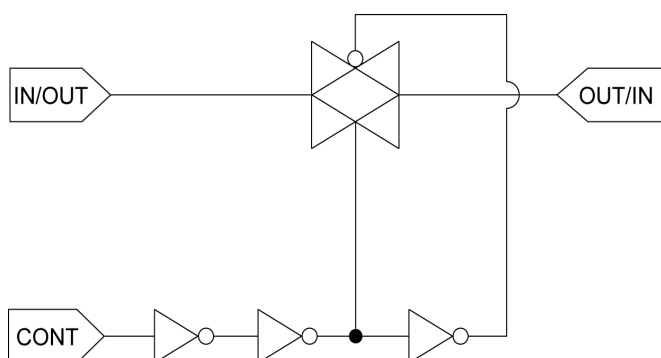
### FEATURES

- High Speed Operation** :  $t_{pd} = 2\text{ns}$  (TYP.)
- Operating Voltage Range** :  $2\text{V} \sim 5.5\text{V}$
- Low Power Consumption** :  $1\mu\text{A}$  (MAX.)
- Low ON Resistance** :  $22\Omega$  (TYP.)
- CMOS Logic Analog Switch**
- Ultra Small Packages** : SSOT-25, SON-6\*
- \* Under Development

### PIN CONFIGURATION



### LOGIC DIAGRAM



### FUNCTIONS

| CONTROL | STATE |
|---------|-------|
| L       | OFF   |
| H       | ON    |

H=High level

L=Low level

## ■ ABSOLUTE MAXIMUM RATINGS

Ta=-40°C~85°C

| PARAMETER                    |         | SYMBOL                            | RATINGS                   | UNITS |
|------------------------------|---------|-----------------------------------|---------------------------|-------|
| Supply Voltage               |         | V <sub>CC</sub>                   | -0.5~+6.0                 | V     |
| Control Input Voltage        |         | V <sub>CONT</sub>                 | -0.5~+6.0                 | V     |
| Switch Output Voltage        |         | V <sub>OUT</sub>                  | -0.5~V <sub>CC</sub> +0.5 | V     |
| Control Input Diode Current  |         | I <sub>IK</sub>                   | -20                       | mA    |
| Switch Output Diode Current  |         | I <sub>OK</sub>                   | ±20                       | mA    |
| Switch Output Current        |         | I <sub>OUT</sub>                  | ±25                       | mA    |
| V <sub>CC</sub> ,GND Current |         | I <sub>CC</sub> ,I <sub>GND</sub> | ±50                       | mA    |
| Power Dissipation *          | SSOT-25 | P <sub>d</sub>                    | 150                       | mW    |
|                              | SON-6   |                                   | 200                       |       |
| Storage Temperature Range    |         | T <sub>stg</sub>                  | -65~+150                  | °C    |

Voltage is all ground standardized.

\* Ta=25°C

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                   | SYMBOL           | V <sub>CC</sub> (V) | CONDITIONS        | UNITS |
|-----------------------------|------------------|---------------------|-------------------|-------|
| Supply Voltage              | V <sub>CC</sub>  | —                   | 2~5.5             | V     |
| Input Voltage               | V <sub>IN</sub>  | —                   | 0~5.5             | V     |
| Output Voltage              | V <sub>OUT</sub> | —                   | 0~V <sub>CC</sub> | V     |
| Operating Temperature Range | Topr             | —                   | -40~+85           | °C    |
| Input Rise and Fall Time    | tr,tf            | 3.3                 | 0~100             | ns/V  |
|                             |                  | 5.0                 | 0~20              |       |

## ■ DC ELECTRICAL CHARACTERISTICS

| PARAMETER                          | SYMBOL              | V <sub>CC</sub> (V) | CONDITIONS                                                                                    | Ta=25°C |      |      | Ta=-40°C~85°C |      | UNITS |
|------------------------------------|---------------------|---------------------|-----------------------------------------------------------------------------------------------|---------|------|------|---------------|------|-------|
|                                    |                     |                     |                                                                                               | MIN.    | TYP. | MAX. | MIN.          | MAX. |       |
| “High” Level Control Input Voltage | V <sub>IH</sub>     | 2.0                 |                                                                                               | 1.5     | —    | —    | 1.5           | —    | V     |
|                                    |                     | 3.0                 |                                                                                               | 2.1     | —    | —    | 2.1           | —    |       |
|                                    |                     | 5.5                 |                                                                                               | 3.85    | —    | —    | 3.85          | —    |       |
| “Low” Level Control Input Voltage  | V <sub>IL</sub>     | 2.0                 |                                                                                               | —       | —    | 0.5  | —             | 0.5  | V     |
|                                    |                     | 3.0                 |                                                                                               | —       | —    | 0.9  | —             | 0.9  |       |
|                                    |                     | 5.5                 |                                                                                               | —       | —    | 1.65 | —             | 1.65 |       |
| Peak ON Resistance                 | R <sub>ONmax</sub>  | 2.0                 | V <sub>CONT</sub> =V <sub>IH</sub>                                                            | —       | 130  | 350  | —             | 550  | Ω     |
|                                    |                     | 3.0                 | V <sub>IN</sub> =0~V <sub>CC</sub>                                                            | —       | 22   | 50   | —             | 65   |       |
|                                    |                     | 4.5                 | I <sub>IN</sub> /O <sub>UT</sub> =1mA                                                         | —       | 12   | 25   | —             | 35   |       |
| ON Resistance                      | R <sub>ON(1)</sub>  | 2.0                 | V <sub>CONT</sub> =V <sub>IH</sub>                                                            | —       | 23   | 50   | —             | 65   |       |
|                                    |                     | 3.0                 | V <sub>IN</sub> =GND or V <sub>CC</sub>                                                       | —       | 14   | 30   | —             | 40   |       |
|                                    |                     | 4.5                 | I <sub>IN</sub> /O <sub>UT</sub> =1mA                                                         | —       | 10   | 20   | —             | 25   |       |
| Power Off Leak Current             | I <sub>S(OFF)</sub> | 5.5                 | V <sub>CONT</sub> =V <sub>IL</sub> , V <sub>IN</sub> =V <sub>CC</sub> , V <sub>OUT</sub> =GND | —       | —    | ±0.1 | —             | ±1.0 | μA    |
| Power On Leak Current              | I <sub>S(ON)</sub>  | 5.5                 | V <sub>CONT</sub> =V <sub>IH</sub> , V <sub>IN</sub> =V <sub>CC</sub> , OR GND                | —       | —    | ±0.1 | —             | ±1.0 | μA    |
| Control Input Current              | I <sub>CONT</sub>   | 5.5                 | V <sub>IN</sub> =V <sub>CC</sub> or GND                                                       | —       | —    | ±0.1 | —             | ±1.0 | μA    |
| Static Supply Current              | I <sub>CC</sub>     | 5.5                 | V <sub>IN</sub> =V <sub>CC</sub> or GND                                                       | —       | —    | 1.0  | —             | 5.0  | μA    |

## ■ SWITCHING ELECTRICAL CHARACTERISTICS

(tr=tf=3ns)

| PARAMETER                          | SYMBOL              | V <sub>CC</sub> (V) | CONDITIONS                                                                                         | Ta=25°C |      |      | Ta=-40°C~85°C |      | UNITS |
|------------------------------------|---------------------|---------------------|----------------------------------------------------------------------------------------------------|---------|------|------|---------------|------|-------|
|                                    |                     |                     |                                                                                                    | MIN.    | TYP. | MAX. | MIN.          | MAX. |       |
| Delay Time                         | t <sub>PLH</sub>    | 2.0                 | R <sub>L</sub> =10kΩ                                                                               | —       | 4    | 20   | —             | 23   | ns    |
|                                    | t <sub>PHL</sub>    | 3.3                 | C <sub>L</sub> =50pF                                                                               | —       | 3    | 6    | —             | 8    |       |
|                                    |                     | 5.0                 |                                                                                                    | —       | 2    | 5    | —             | 6    |       |
| Output Enable Time                 | t <sub>ZL</sub>     | 2.0                 | R <sub>L</sub> =1kΩ                                                                                | —       | 9    | 50   | —             | 65   | ns    |
|                                    | t <sub>ZH</sub>     | 3.3                 | C <sub>L</sub> =50pF                                                                               | —       | 5    | 10   | —             | 12   |       |
|                                    |                     | 5.0                 |                                                                                                    | —       | 3    | 8    | —             | 10   |       |
| Output Disable Time                | t <sub>LZ</sub>     | 2.0                 | R <sub>L</sub> =1kΩ                                                                                | —       | 12   | 60   | —             | 75   | ns    |
|                                    | t <sub>HZ</sub>     | 3.3                 | C <sub>L</sub> =50pF                                                                               | —       | 10   | 23   | —             | 27   |       |
|                                    |                     | 5.0                 |                                                                                                    | —       | 8    | 20   | —             | 25   |       |
| Sine Wave Distortion Rate          |                     | 3.0                 | R <sub>L</sub> =10kΩ<br>C <sub>L</sub> =50pF<br>f <sub>IN</sub> =1kHz                              | —       | 0.05 | —    | —             | —    | %     |
| -3dB Band Width                    |                     | 3.0                 | R <sub>L</sub> =600kΩ, C <sub>L</sub> =50pF<br>$20 \log_{10} \frac{V_{OUT}}{V_{IN}} = -3\text{dB}$ | —       | 200  | —    | —             | —    | MHz   |
| Feed Through<br>(Switch- off)      |                     | 3.0                 | R <sub>L</sub> =600kΩ<br>C <sub>L</sub> =50pF<br>f <sub>IN</sub> =1kHz                             | —       | -60  | —    | —             | —    | dB    |
| Cross Talk<br>(Control Switch)     |                     | 2.0                 | R <sub>L</sub> =600kΩ                                                                              | —       | 60   | —    | —             | —    | mV    |
|                                    |                     | 3.0                 | C <sub>L</sub> =50pF                                                                               | —       | 100  | —    | —             | —    |       |
|                                    |                     | 4.5                 | f <sub>IN</sub> =1kHz                                                                              | —       | 150  | —    | —             | —    |       |
| Maximum Control<br>Input Frequency |                     | 2.0                 | R <sub>L</sub> =1kΩ                                                                                | —       | 30   | —    | —             | —    | MHz   |
|                                    |                     | 3.0                 | C <sub>L</sub> =15pF                                                                               | —       | 30   | —    | —             | —    |       |
|                                    |                     | 4.5                 | V <sub>OUT</sub> =V <sub>CC</sub> /2                                                               | —       | 30   | —    | —             | —    |       |
| Control Input Capacitance          | C <sub>IN</sub>     | —                   |                                                                                                    | —       | 5    | 10   | —             | 10   | pF    |
| Switch Input/Output Capacitance    | C <sub>IN/OUT</sub> | —                   |                                                                                                    | —       | 6    | —    | —             | —    | pF    |
| Feed Through Capacitance           | C <sub>IN-OUT</sub> | —                   |                                                                                                    | —       | 0.5  | —    | —             | —    | pF    |
| Power Dissipation Capacitance      | CPD                 | —                   |                                                                                                    | —       | 13   | —    | —             | —    | pF    |

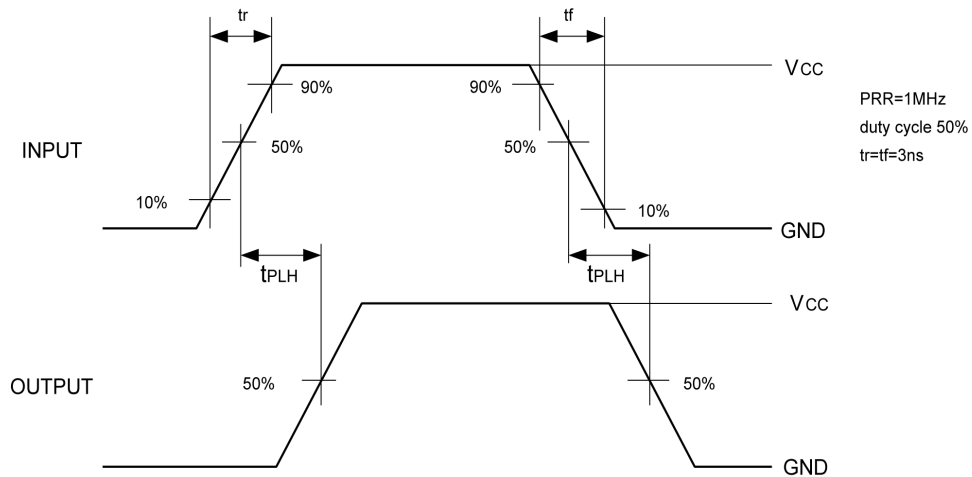
Note: CPD is defined as the value of the internal equivalent capacitance which is derived from the operating supply current at times of "No Load".

Ensure that the average operating supply current at times of "No Load" meets the following conditions:

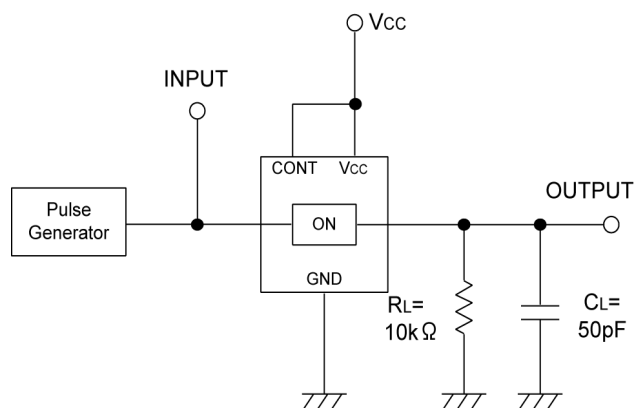
$$I_{CC}(\text{opr}) = CPD \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

## ■ DELAY TIME

### ● WAVEFORM



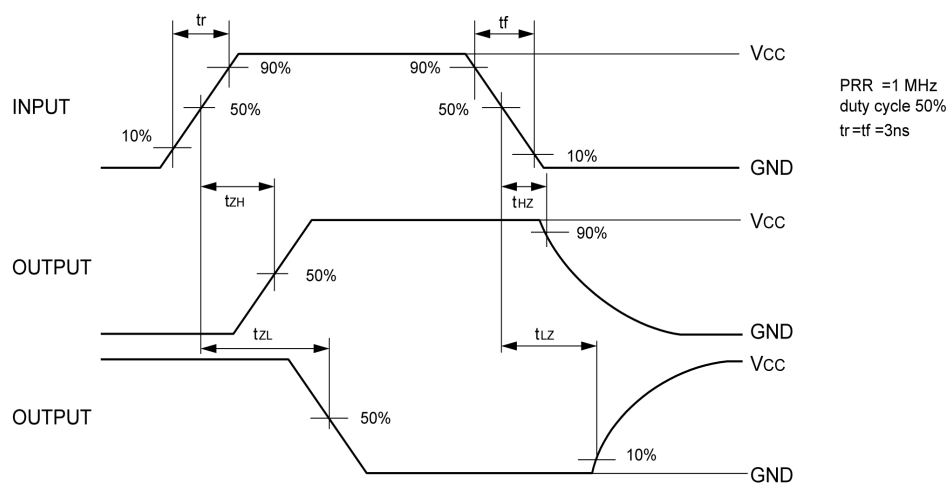
### ● TEST CIRCUIT



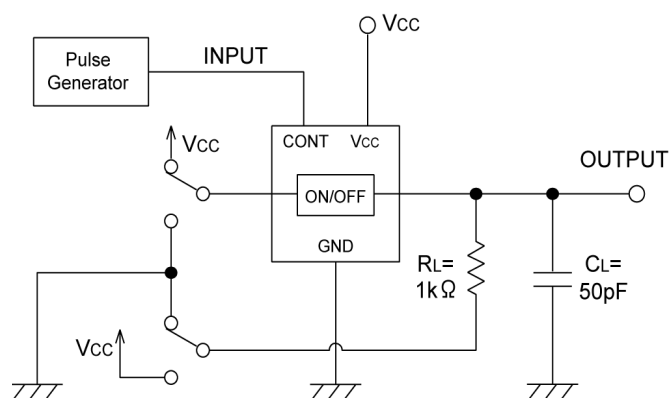
Note: Open output when measuring supply current

## ■ OUTPUT ENABLE TIME, OUTPUT DISABLE TIME

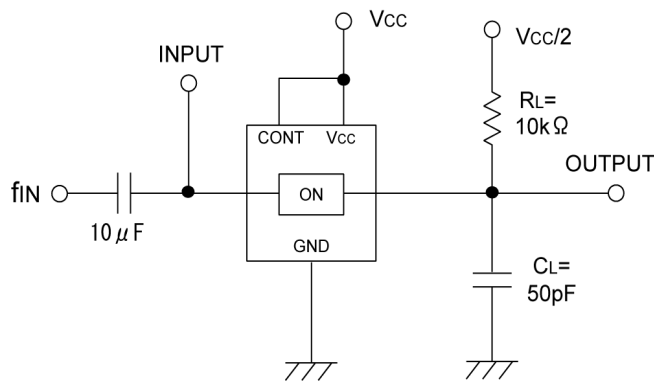
### ● WAVEFORM



### ● TEST CIRCUIT

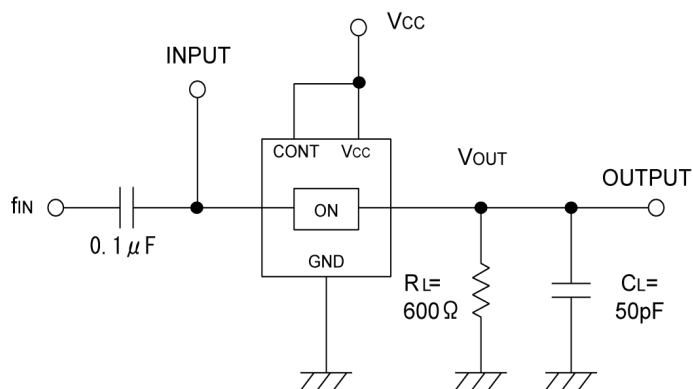


## ■ SINE WAVE DISTORTION RATE



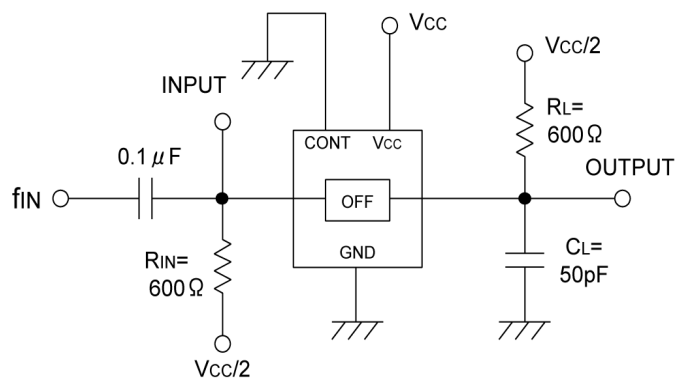
\* Input by sine wave

## ■ -3dB BAND WIDTH



\* Input by sine wave

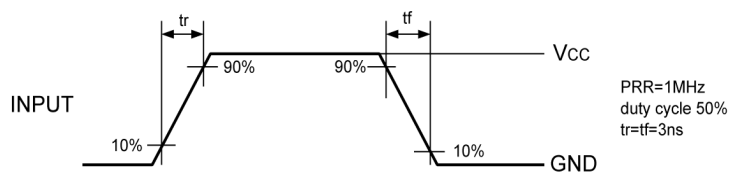
## ■ FEED THROUGH TEST CIRCUIT



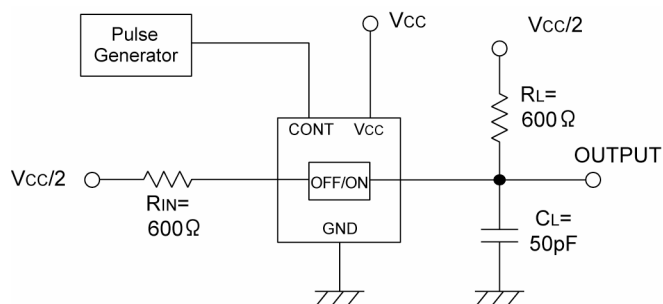
\* Input by sine wave

## ■ CROSS TALK

### ● WAVEFORM

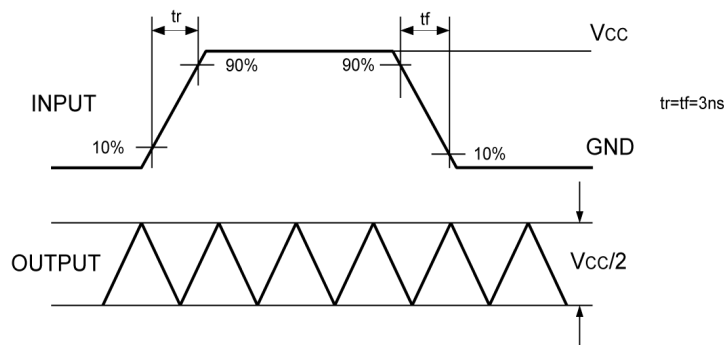


### ● TEST CIRCUIT

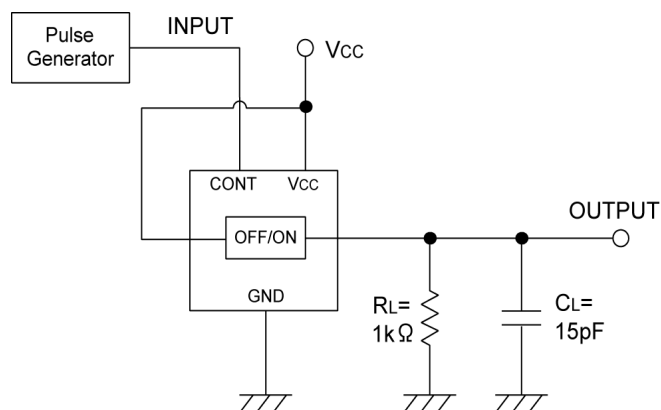


## ■ MAXIMUM CONTROL INPUT FREQUENCY

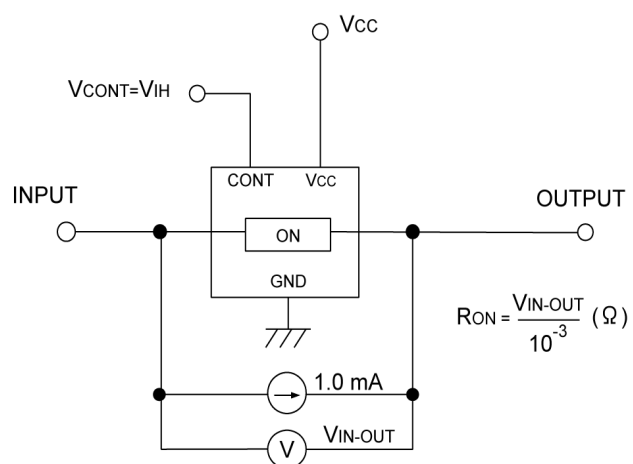
### ● WAVEFORM



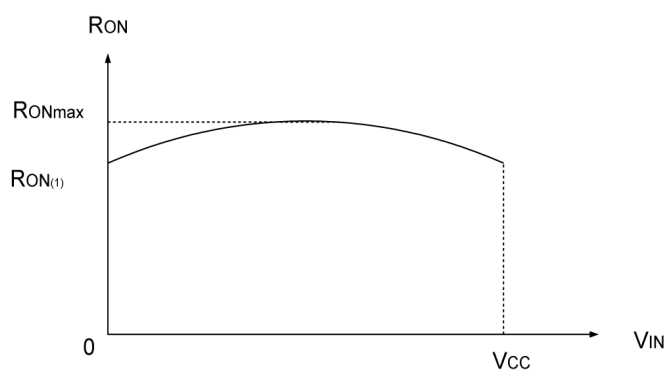
### ● TEST CIRCUIT



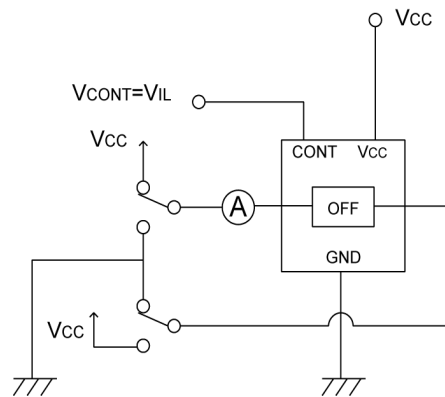
## ■ ON RESISTANCE



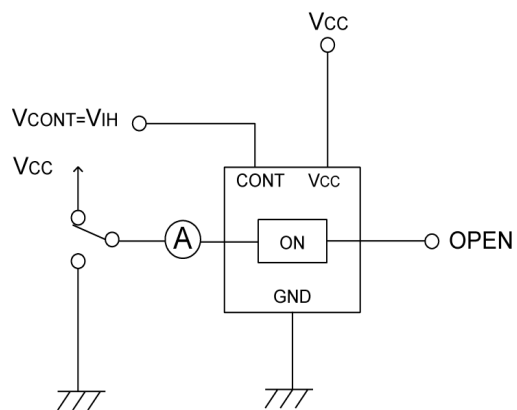
## ■ VOLTAGE DEPENDANCIES OF ON RESISTANCE



## ■ POWER OFF LEAK CURRENT



## ■ POWER ON LEAK CURRENT



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