

## CD4066BM96-HX 四双向模拟开关

### 概况

CD4066BM96-HX 提供四个单极、单掷模拟开关功能。每个开关都有两个输入/输出端子 (nY 和 nZ) 和一个主动的 HIGH 启用输入 (nE)。当 nE 较低时, 模拟开关被关闭。

### 主要特点

宽电源电压范围从 3V 到 9V

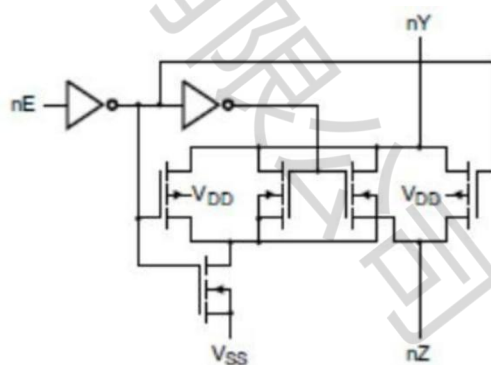
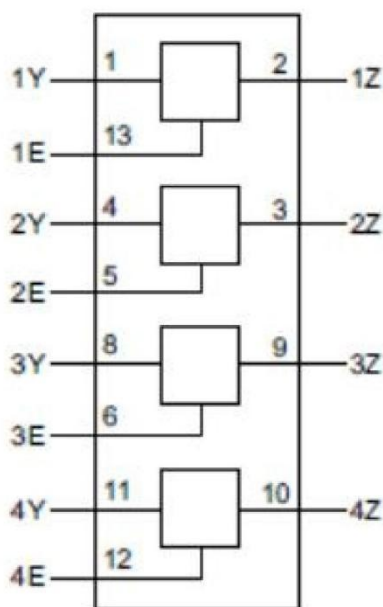
全静态运行

5 V 和 9V 参数额定值

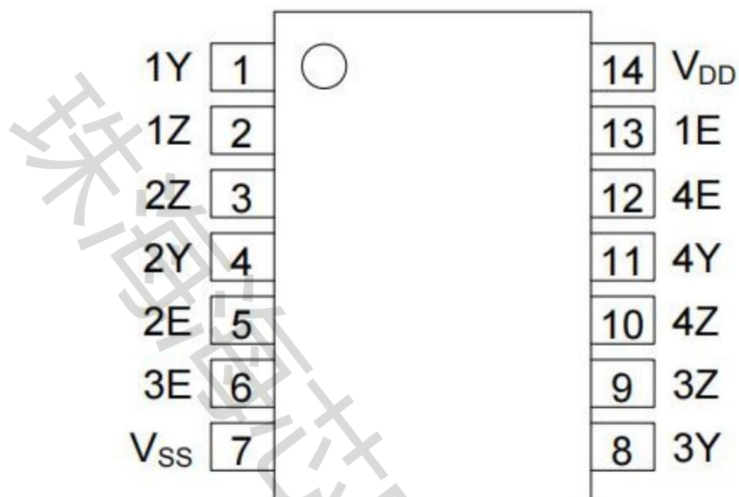
标准化对称输出特性

指定从-40°C到+125°C

### 逻辑图



## Pin Configurations



| Pin No. | Pin Name        | Description                 |
|---------|-----------------|-----------------------------|
| 1       | 1Y              | independent input or output |
| 2       | 1Z              | independent input or output |
| 3       | 2Z              | independent input or output |
| 4       | 2Y              | independent input or output |
| 5       | 2E              | enable input (active HIGH)  |
| 6       | 3E              | enable input (active HIGH)  |
| 7       | V <sub>ss</sub> | ground (0V)                 |
| 8       | 3Y              | independent input or output |
| 9       | 3Z              | independent input or output |
| 10      | 4Z              | independent input or output |
| 11      | 4Y              | independent input or output |
| 12      | 4E              | enable input (active HIGH)  |
| 13      | 1E              | enable input (active HIGH)  |
| 14      | V <sub>DD</sub> | supply voltage              |

## Function Table

| Input | Switch |
|-------|--------|
| nE    |        |
| H     | ON     |
| L     | OFF    |

Note: H=HIGH voltage level; L=LOW voltage level.

## Electrical Parameter

### Absolute Maximum Ratings

(Voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

| Parameter               | Symbol    | Conditions                          | Min. | Max.         | Unit |
|-------------------------|-----------|-------------------------------------|------|--------------|------|
| supply voltage          | $V_{DD}$  | -                                   | -0.5 | +12          | V    |
| input voltage           | $V_I$     | -                                   | -0.5 | $V_{DD}+0.5$ | V    |
| input clamping current  | $I_{IK}$  | $V_I < 0.5V$ or $V_I > V_{DD}+0.5V$ | -    | $\pm 10$     | mA   |
| input/output current    | $I_{I/O}$ | -                                   | -    | $\pm 10$     | mA   |
| storage temperature     | $T_{stg}$ | -                                   | -65  | +150         | °C   |
| total power dissipation | $P_{tot}$ | -                                   | -    | 500          | mW   |
| device dissipation      | P         | per output transistor               | -    | 100          | mW   |

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## Recommended Operating Conditions

( $T_{amb}=25^{\circ}\text{C}$ ;  $R_L=10\text{k}\Omega$ ;  $C_L=50\text{pF}$ ;  $nE=V_{DD}$ ;  $Vis=V_{DD}=5\text{V}$ .)

| Parameter                                      | Symbol             | Conditions           | Min. | Typ. | Max.     | Unit               |
|------------------------------------------------|--------------------|----------------------|------|------|----------|--------------------|
| supply voltage                                 | $V_{DD}$           | -                    | 3    | 5    | 9        | V                  |
| ambient temperature                            | $T_{amb}$          | in free air          | -40  | -    | +125     | $^{\circ}\text{C}$ |
| input voltage                                  | $V_I$              | -                    | 0    | -    | $V_{DD}$ | V                  |
| Disable output time<br>(High level→turnoff)    | $t_{PHZ}$          | nE to nZ or nE to nY | -    | 80   | 160      | ns                 |
| Disable output time<br>(Low level→turnoff)     | $t_{PLZ}$          | nE to nZ or nE to nY | -    | 80   | 160      | ns                 |
| Enable output time<br>(turnoff→high/low level) | $t_{PZH}, t_{PZL}$ | -                    | -    | 45   | 90       | ns                 |
| input capacitance                              | $C_i$              | -                    | -    | -    | 7.5      | pF                 |

## Electrical Characteristics

### DC Characteristics 1

( $T_{amb}=25^{\circ}\text{C}$ , voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

| Parameter                | Symbol          | Conditions (V)                                                             |                                                      | T <sub>amb</sub> =25 °C |      |      | Unit |
|--------------------------|-----------------|----------------------------------------------------------------------------|------------------------------------------------------|-------------------------|------|------|------|
|                          |                 |                                                                            |                                                      | Min.                    | Typ. | Max. |      |
| supply current           | I <sub>DD</sub> | V <sub>I</sub> =V <sub>DD</sub> or V <sub>SS</sub> ,<br>I <sub>O</sub> =0A | V <sub>DD</sub> =5V                                  | -                       | -    | 1.0  | uA   |
|                          |                 |                                                                            | V <sub>DD</sub> =9V                                  | -                       | -    | 2.0  | uA   |
| HIGH-level input voltage | V <sub>IH</sub> | I <sub>O</sub>  <1uA                                                       | V <sub>DD</sub> =5V,<br>V <sub>O</sub> =0.5V or 4.5V | 3.5                     | -    | -    | V    |
|                          |                 |                                                                            | V <sub>DD</sub> =9V,<br>V <sub>O</sub> =0.5V or 8V   | 7.0                     | -    | -    | V    |
| LOW-level input voltage  | V <sub>IL</sub> | I <sub>O</sub>  <1uA                                                       | V <sub>DD</sub> =5V,<br>V <sub>O</sub> =0.5V or 4.5V | -                       | -    | 1.5  | V    |
|                          |                 |                                                                            | V <sub>DD</sub> =9V,<br>V <sub>O</sub> =0.5V or 8V   | -                       | -    | 3.0  | V    |
| input leakage current    | I <sub>I</sub>  | V <sub>I</sub> =0V or 9V, V <sub>DD</sub> =9V                              |                                                      | -                       | -    | 1.0  | uA   |
|                          |                 | V <sub>I</sub> =0V to V <sub>DD</sub> -V <sub>EE</sub>                     | V <sub>DD</sub> -V <sub>EE</sub> =5V                 | -                       | 350  | 2500 | Ω    |
|                          |                 |                                                                            | V <sub>DD</sub> -V <sub>EE</sub> =9V                 | -                       | 80   | 245  | Ω    |

|                                         |                 |                             |                    |   |     |     |          |
|-----------------------------------------|-----------------|-----------------------------|--------------------|---|-----|-----|----------|
| ON resistance (rail)                    | $R_{ON}$        | $V_I=0V$                    | $V_{DD}-V_{EE}=5V$ | - | 115 | 340 | $\Omega$ |
|                                         |                 |                             | $V_{DD}-V_{EE}=9V$ | - | 50  | 160 | $\Omega$ |
|                                         |                 | $V_I=V_{DD}-V_{EE}$         | $V_{DD}-V_{EE}=5V$ | - | 120 | 365 | $\Omega$ |
|                                         |                 |                             | $V_{DD}-V_{EE}=9V$ | - | 65  | 200 | $\Omega$ |
| ON resistance mismatch between channels | $\Delta R_{ON}$ | $V_I=0V$ to $V_{DD}-V_{EE}$ | $V_{DD}-V_{EE}=5V$ | - | 25  | -   | $\Omega$ |
|                                         |                 |                             | $V_{DD}-V_{EE}=9V$ | - | 10  | -   | $\Omega$ |

## DC Characteristics 2

( $T_{amb}=-40^{\circ}C$  to  $+85^{\circ}C$ , voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

| Parameter                | Symbol          | Conditions (V)                                                             |                                                      | T <sub>amb</sub> =-40 °C |      | T <sub>amb</sub> =+85 °C |      | Unit |
|--------------------------|-----------------|----------------------------------------------------------------------------|------------------------------------------------------|--------------------------|------|--------------------------|------|------|
|                          |                 |                                                                            |                                                      | Min.                     | Max. | Min.                     | Max. |      |
| supply current           | I <sub>DD</sub> | V <sub>I</sub> =V <sub>DD</sub> or V <sub>SS</sub> ,<br>I <sub>O</sub> =0A | V <sub>DD</sub> =5V                                  | -                        | 1.0  | -                        | 7.5  | uA   |
|                          |                 |                                                                            | V <sub>DD</sub> =9V                                  | -                        | 2.0  | -                        | 15.0 | uA   |
| HIGH-level input voltage | V <sub>IH</sub> | I <sub>O</sub>  <1uA                                                       | V <sub>DD</sub> =5V,<br>V <sub>O</sub> =0.5V or 4.5V | 3.5                      | -    | 3.5                      | -    | V    |
|                          |                 |                                                                            | V <sub>DD</sub> =9V,<br>V <sub>O</sub> =0.5V or 8V   | 7.0                      | -    | 7.0                      | -    | V    |
| LOW-level input voltage  | V <sub>IL</sub> | I <sub>O</sub>  <1uA                                                       | V <sub>DD</sub> =5V,<br>V <sub>O</sub> =0.5V or 4.5V | -                        | 1.5  | -                        | 1.5  | V    |
|                          |                 |                                                                            | V <sub>DD</sub> =9V,<br>V <sub>O</sub> =0.5V or 8V   | -                        | 3.0  | -                        | 3.0  | V    |
| input leakage current    | I <sub>I</sub>  | V <sub>I</sub> =0V or 9V, V <sub>DD</sub> =9V                              |                                                      | -                        | -    | -                        | 1.0  | uA   |

## DC Characteristics 3

( $T_{amb}=-40^{\circ}C$  to  $+125^{\circ}C$ , voltages are referenced to  $V_{SS}$  (ground=0V), unless otherwise specified.)

| Parameter      | Symbol          | Conditions (V)                                                                |                     | T <sub>amb</sub> =-40 °C |      | T <sub>amb</sub> =+125 °C |      | Unit |
|----------------|-----------------|-------------------------------------------------------------------------------|---------------------|--------------------------|------|---------------------------|------|------|
|                |                 |                                                                               |                     | Min.                     | Max. | Min.                      | Max. |      |
| supply current | I <sub>DD</sub> | V <sub>I</sub> =V <sub>DD</sub> or<br>V <sub>SS</sub> ,<br>I <sub>o</sub> =0A | V <sub>DD</sub> =5V | -                        | 1.0  | -                         | 7.5  | uA   |
|                |                 |                                                                               | V <sub>DD</sub> =9V | -                        | 2.0  | -                         | 15.0 | uA   |

|                          |          |                                |                                       |     |     |     |     |         |
|--------------------------|----------|--------------------------------|---------------------------------------|-----|-----|-----|-----|---------|
| HIGH-level input voltage | $V_{IH}$ | $ I_o  < 1\mu A$               | $V_{DD}=5V$ ,<br>$V_O=0.5V$ or $4.5V$ | 3.5 | -   | 3.5 | -   | V       |
|                          |          |                                | $V_{DD}=9V$ ,<br>$V_O=0.5V$ or $8V$   | 7.0 | -   | 7.0 | -   | V       |
| LOW-level input voltage  | $V_{IL}$ | $ I_o  < 1\mu A$               | $V_{DD}=5V$ ,<br>$V_O=0.5V$ or $4.5V$ | -   | 1.5 | -   | 1.5 | V       |
|                          |          |                                | $V_{DD}=9V$ ,<br>$V_O=0.5V$ or $8V$   | -   | 3.0 | -   | 3.0 | V       |
| input leakage current    | $I_I$    | $V_I=0V$ or $9V$ , $V_{DD}=9V$ |                                       | -   | -   | -   | 1.0 | $\mu A$ |

## AC Characteristics 1

( $T_{amb}=25^\circ C$ ,  $V_{EE}=V_{SS}=0V$ ,  $t_r$ ,  $t_f \leq 20ns$ ,  $C_L=50pF$ ,  $R_L=10k\Omega$ , unless otherwise specified.)

| Parameter                           | Symbol    | Conditions                      | Min.        | Typ. | Max. | Unit |    |
|-------------------------------------|-----------|---------------------------------|-------------|------|------|------|----|
| HIGH to LOW propagation delay time  | $t_{PHL}$ | nY to nZ; nZ tonY; see Figure 4 | $V_{DD}=5V$ | -    | 10   | 20   | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 5    | 10   | ns |
| LOW to HIGH propagation delay       | $t_{PLH}$ | nY to nZ; nZ tonY; see Figure 4 | $V_{DD}=5V$ | -    | 10   | 20   | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 5    | 10   | ns |
| HIGH to OFF-state propagation delay | $t_{PHZ}$ | nE tonY, nZ; see Figure 5       | $V_{DD}=5V$ | -    | 80   | 160  | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 65   | 130  | ns |
| LOW to OFF-state propagation delay  | $t_{PLZ}$ | nE tonY, nZ; see Figure 5       | $V_{DD}=5V$ | -    | 80   | 160  | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 70   | 140  | ns |
| OFF-state to HIGH propagation delay | $t_{PZH}$ | nE tonY, nZ; see Figure 5       | $V_{DD}=5V$ | -    | 40   | 80   | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 20   | 40   | ns |
| OFF-state to LOW propagation        | $t_{PZL}$ | nE tonY, nZ; see                | $V_{DD}=5V$ | -    | 45   | 90   | ns |
|                                     |           |                                 | $V_{DD}=9V$ | -    | 20   | 40   | ns |

|       |  |          |  |  |  |  |  |
|-------|--|----------|--|--|--|--|--|
| delay |  | Figure 5 |  |  |  |  |  |
|-------|--|----------|--|--|--|--|--|

## AC Characteristics 2

( $T_{amb}=25^{\circ}\text{C}$ ,  $V_{EE}=V_{SS}=0\text{V}$ ,  $V_I=0.5V_{DD}$  (p-p), unless otherwise specified.)

| Parameter                          | Symbol    | Conditions                                                                         |             | Min. | Typ. | Max. | Unit |
|------------------------------------|-----------|------------------------------------------------------------------------------------|-------------|------|------|------|------|
| Square wave distortion             | $d_{sin}$ | see Figure 6;<br>$R_L=10k\Omega$ ;<br>$C_L=15pF$ ; channel ON; $f_i=1kHz$          | $V_{DD}=5V$ | 0.25 | -    | -    | %    |
|                                    |           |                                                                                    | $V_{DD}=9V$ | 0.04 | -    | -    | %    |
| any two channel crosstalk          | $f_{ct}$  | $V_{DD}=9V$ , see note2                                                            |             | 1    | -    | -    | MHz  |
| crosstalk voltage (nE to nY to nZ) | $V_{ct}$  | see Figure 7; $R_L=10k\Omega$ ; $C_L=15pF$ ;<br>$E^-$ or $Sn=V_{DD}$ (square-wave) |             | 50   | -    | -    | mV   |
| OFF frequency                      | $f_{OFF}$ | $V_{DD}=9V$ , see note3                                                            |             | 1    | -    | -    | MHz  |
| conduction frequency               | $f_{ON}$  | $V_{DD}=5V$ , see note4                                                            |             | -    | -    | -    | MHz  |
|                                    |           | $V_{DD}=9V$ , see note4                                                            |             | 90   | -    | -    | MHz  |

### Note:

[1]  $f_i$  is biased at  $0.5V_{DD}$ ;  $V_I=0.5V_{DD}$  (p-p).

[2]  $R_L=1\text{k}\Omega$ ;  $20\log V_{os}/V_{is}=-50\text{dB}$ , see Figure 8.

[3]  $R_L=1\text{k}\Omega$ ;  $C_L=5\text{pF}$ , channel off,  $20\log V_{os}/V_{is}=-50\text{dB}$ , see Figure 6.

[4]  $R_L=1\text{k}\Omega$ ;  $C_L=5\text{pF}$ , channel on,  $20\log V_{os}/V_{is}=-3\text{dB}$ , see Figure 6.

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## Testing Circuit

### AC Testing Circuit 1

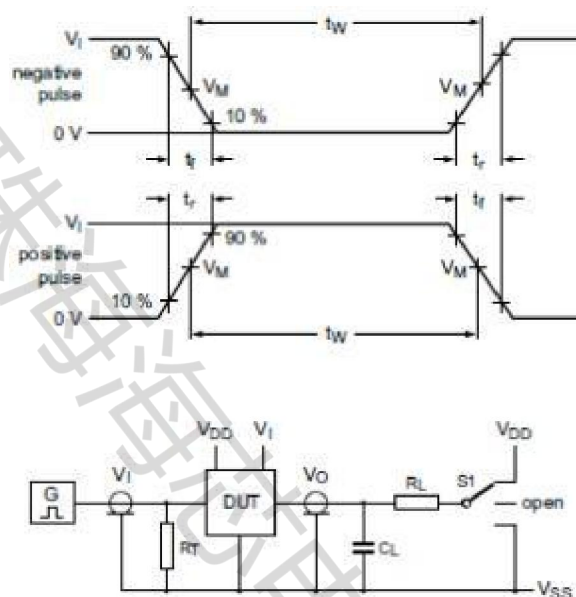


Figure 3. Test circuit for switching times

Definitions for  
test circuit:

DUT=Device

Under Test.

$C_L$ =Load capacitance including jig and probe capacitance.

$R_T$ =Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  $R_L$ =Load resistance.

### AC Testing Waveforms

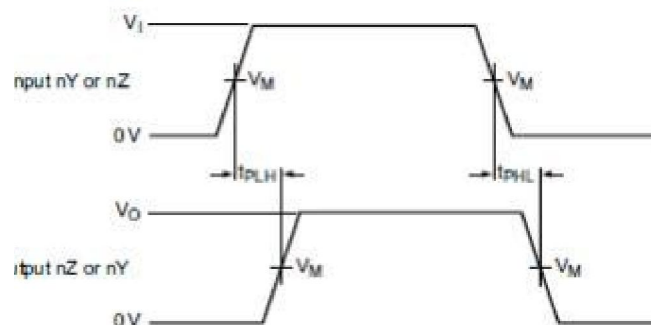


Figure 4. nY or nZ to nZ or nY propagation delays



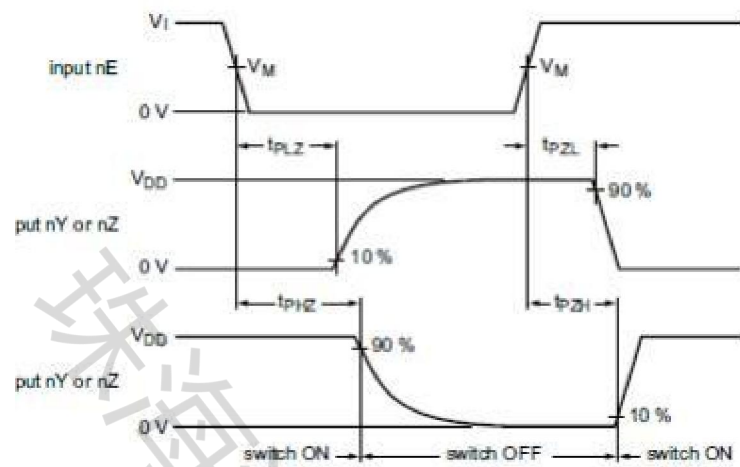
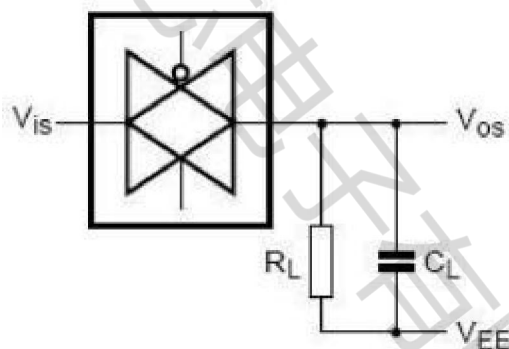


Figure 5. Enable and disable times

## AC Testing Circuit 2



Square wave distortion degree of cut-off frequency and conduction frequency test pattern

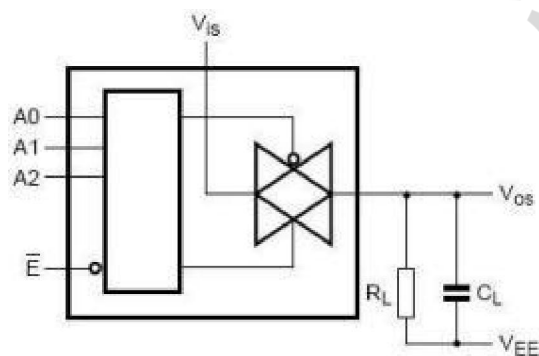


Figure 7. Crosstalk logical input/output test

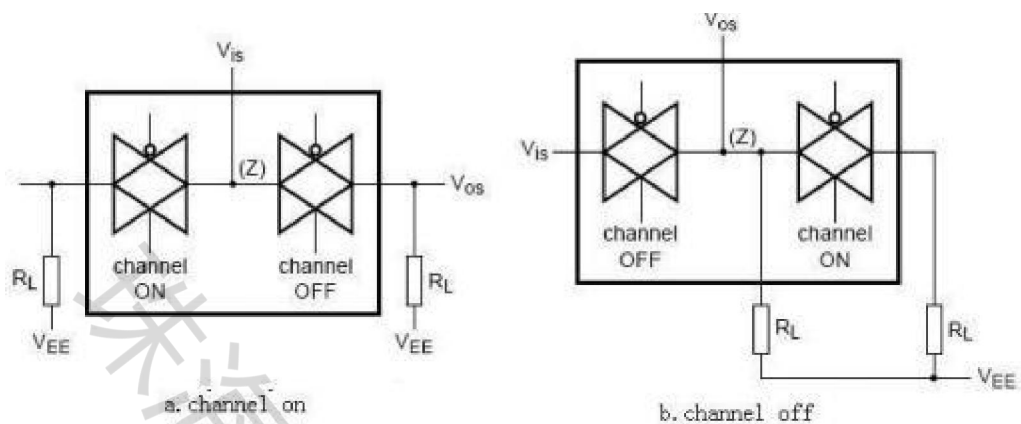


Figure 8. Inter channel Crosstalk

## On Resistance Waveform And Test Circuit

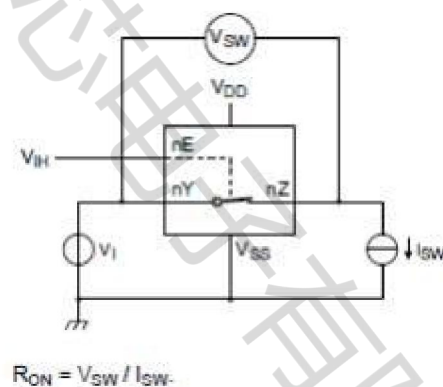


Figure 9. Test circuit for measuring  $R_{ON}$

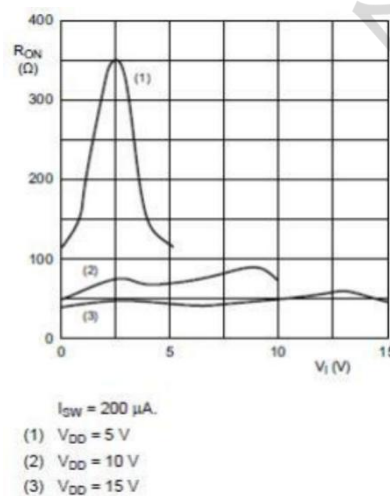
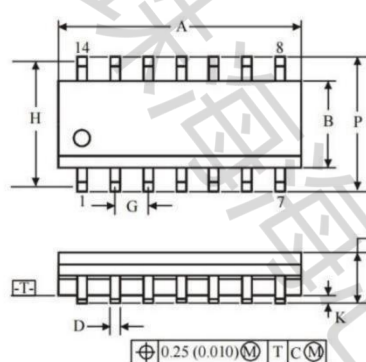


Figure 10. Typical  $R_{ON}$  as a function of input voltage

## 封装

### SOP14 (Package Outline Dimensions)



#### NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

| Symbol | Dimension, mm |      |
|--------|---------------|------|
|        | MIN           | MAX  |
| A      | 8.55          | 8.75 |
| B      | 3.8           | 4    |
| C      | 1.35          | 1.75 |
| D      | 0.33          | 0.51 |
| F      | 0.4           | 1.27 |
| G      | 1.27          |      |
| H      | 5.27          |      |
| J      | 0°            | 8°   |
| K      | 0.1           | 0.25 |
| M      | 0.19          | 0.25 |
| P      | 5.8           | 6.2  |
| R      | 0.25          | 0.5  |

| Part Number   | Package Type | Package | quantity |
|---------------|--------------|---------|----------|
| CD4066BM96-HX | SOP-14       | Taping  | 2500     |