## 74HC1G66; 74HCT1G66

Single-pole single-throw analog switch
Rev. 04 - 19 December 2008
Product data sheet

## 1. General description

74HC1G66 and 74HCT1G66 are high-speed Si-gate CMOS devices. They are single-pole single-throw analog switches. The switch has two input/output pins ( Y and Z ) and an active HIGH enable input pin (E). When pin E is LOW, the analog switch is turned off.

The non-standard output currents are equal to those of the 74 HC 4066 and 74 HCT 4066 .

## 2. Features

- Wide supply voltage range from 2.0 V to 10.0 V for the 74 HC 1 G 66
- Very low ON resistance:
- $45 \Omega$ (typ.) at $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$
- $30 \Omega$ (typ.) at $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$
- $25 \Omega$ (typ.) at $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$
- High noise immunity
- Low power dissipation
- Multiple package options
- ESD protection:
- HBM JESD22-A114E exceeds 2000 V
- MM JESD22-A115-A exceeds 200 V
- Specified from $-40^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ and $-40^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$


## 3. Ordering information

Table 1. Ordering information

| Type number | Package |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | Temperature range | Name | Description | Version |
| 74 HC 1 G 66 GW | $-40^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$ | TSSOP5 | plastic thin shrink small outline package; <br> 5 | SOT353-1 |
| 74 HCT leads; body width 1.25 mm |  |  |  |  |

## 4. Marking

Table 2. Marking codes

| Type number | Marking |
| :--- | :--- |
| 74HC1G66GW | HL |
| 74HCT1G66GW | TL |
| 74HC1G66GV | H 66 |
| 74HCT1G66GV | T66 |

## 5. Functional diagram



Fig 1. Logic symbol


Fig 2. Logic diagram

## 6. Pinning information

### 6.1 Pinning



Fig 3. Pin configuration SOT353-1 and SOT753

### 6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
| :--- | :--- | :--- |
| Y | 1 | independent input or output |
| Z | 2 | independent input or output |
| GND | 3 | ground $(0 \mathrm{~V})$ |
| E | 4 | enable input (active HIGH) |
| $\mathrm{V}_{\mathrm{CC}}$ | 5 | supply voltage |

## 7. Functional description

Table 4. Function table[1]

| Input E | Switch |
| :--- | :--- |
| L | OFF |
| $H$ | ON |

[1] $H=$ HIGH voltage level; $L=$ LOW voltage level.

## 8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{V}_{\mathrm{CC}}$ | supply voltage |  | -0.5 | +11.0 | V |
| $\mathrm{I}_{\mathrm{KK}}$ | input clamping current | $\mathrm{V}_{\mathrm{I}}<-0.5 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{I}}>\mathrm{V}_{\mathrm{CC}}+0.5 \mathrm{~V}$ | $\underline{[1]}-$ | $\pm 20$ | mA |
| $\mathrm{I}_{\mathrm{SK}}$ | switch clamping current | $\mathrm{V}_{\mathrm{I}}<-0.5 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{I}}>\mathrm{V}_{\mathrm{CC}}+0.5 \mathrm{~V}$ | $\underline{[1]}-$ | $\pm 20$ | mA |
| $\mathrm{I}_{\mathrm{SW}}$ | switch current | $\mathrm{V}_{\mathrm{SW}}>-0.5 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{SW}}<\mathrm{V}_{\mathrm{CC}}+0.5 \mathrm{~V}$ | - | $\pm 25$ | mA |
| $\mathrm{I}_{\mathrm{CC}}$ | supply current |  | - | 50 | mA |
| $\mathrm{I}_{\mathrm{GND}}$ | ground current |  | -50 | - | mA |
| $\mathrm{T}_{\text {stg }}$ | storage temperature |  | -65 | +150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{P}_{\text {tot }}$ | total power dissipation | $\mathrm{T}_{\mathrm{amb}}=-40^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$ | [2] - | 250 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For TSSOP5 and SC-74A packages: above $87.5^{\circ} \mathrm{C}$ the value of $\mathrm{P}_{\text {tot }}$ derates linearly with $4.0 \mathrm{~mW} / \mathrm{K}$.

## 9. Recommended operating conditions

Table 6. Recommended operating conditions
Voltages are referenced to GND (ground $=0$ V).[1]

| Symbol | Parameter | Conditions | 74HC1G66 |  |  | 74HCT1G66 |  |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Min | Typ | Max | Min | Typ | Max |  |
| $\mathrm{V}_{\text {CC }}$ | supply voltage |  | 2.0 | 5.0 | 10.0 | 4.5 | 5.0 | 5.5 | V |
| $V_{\text {I }}$ | input voltage |  | 0 | - | $\mathrm{V}_{\mathrm{CC}}$ | 0 | - | $\mathrm{V}_{\text {CC }}$ | V |
| $\mathrm{V}_{\text {SW }}$ | switch voltage |  | 0 | - | $\mathrm{V}_{\text {CC }}$ | 0 | - | $\mathrm{V}_{\text {cc }}$ | V |
| $\mathrm{T}_{\text {amb }}$ | ambient temperature |  | -40 | +25 | +125 | -40 | +25 | +125 | ${ }^{\circ} \mathrm{C}$ |
| $\Delta t / \Delta \mathrm{V}$ | input transition rise and fall rate | $\mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | - | - | 625 | - | - | - | $\mathrm{ns} / \mathrm{V}$ |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 1.67 | 139 | - | 1.67 | 139 | $\mathrm{ns} / \mathrm{V}$ |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | - | - | 83 | - | - | - | $\mathrm{ns} / \mathrm{V}$ |
|  |  | $\mathrm{V}_{\mathrm{CC}}=10.0 \mathrm{~V}$ | - | - | 35 | - | - | - | $\mathrm{ns} / \mathrm{V}$ |

[1] To avoid drawing $V_{C C}$ current out of pin $Z$, when switch current flows in pin $Y$, the voltage drop across the bidirectional switch must not exceed 0.4 V . If the switch current flows into pin Z , no $\mathrm{V}_{\mathrm{CC}}$ current will flow out of terminal Y . In this case there is no limit for the voltage drop across the switch, but the voltage at pins $Y$ and $Z$ may not exceed $V_{c c}$ or GND.

## 10. Static characteristics

Table 7. Static characteristics
Voltages are referenced to GND (ground = 0 V ).

| Symbol | Parameter | Conditions | $-40{ }^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C}$ to +125 ${ }^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Min | Typ[1] | Max | Min | Max |  |
| 74HC1G66 |  |  |  |  |  |  |  |  |
| $\mathrm{V}_{\mathrm{IH}}$ | HIGH-level input voltage | $\mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | 1.5 | 1.2 | - | 1.5 | - | V |
|  |  | $\mathrm{V}_{C C}=4.5 \mathrm{~V}$ | 3.15 | 2.4 | - | 3.15 | - | V |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | 4.2 | 3.2 | - | 4.2 | - | V |
|  |  | $\mathrm{V}_{C C}=9.0 \mathrm{~V}$ | 6.3 | 4.7 | - | 6.3 | - | V |
| $\mathrm{V}_{\text {IL }}$ | LOW-level input voltage | $\mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | - | 0.8 | 0.5 | - | 0.5 | V |
|  |  | $\mathrm{V}_{C C}=4.5 \mathrm{~V}$ | - | 2.1 | 1.35 | - | 1.35 | V |
|  |  | $\mathrm{V}_{C C}=6.0 \mathrm{~V}$ | - | 2.8 | 1.8 | - | 1.8 | V |
|  |  | $\mathrm{V}_{C C}=9.0 \mathrm{~V}$ | - | 4.3 | 2.7 | - | 2.7 | V |
| 1 | input leakage current | $\mathrm{E} ; \mathrm{V}_{1}=\mathrm{V}_{\mathrm{CC}}$ or GND |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{C C}=6.0 \mathrm{~V}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
|  |  | $V_{C C}=10.0 \mathrm{~V}$ | - | 0.2 | 2.0 | - | 2.0 | $\mu \mathrm{A}$ |
| $\mathrm{I}_{\text {S(OFF) }}$ | OFF-state leakage current | Y or $\mathrm{Z} ; \mathrm{V}_{\mathrm{CC}}=10 \mathrm{~V}$; see $\underline{\text { Figure } 4}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
| $\mathrm{I}_{\text {(ON })}$ | ON-state leakage current | Y or $\mathrm{Z} ; \mathrm{V}_{\mathrm{CC}}=10 \mathrm{~V}$; see $\underline{\text { Figure } 5}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
| ICC | supply current | $\mathrm{E}, \mathrm{Y}$ or $\mathrm{Z} ; \mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}$ or GND ; $\mathrm{V}_{\mathrm{SW}}=\mathrm{GND}$ or $\mathrm{V}_{\mathrm{CC}}$ |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | - | 1.0 | 10 | - | 20 | $\mu \mathrm{A}$ |
|  |  | $\mathrm{V}_{\mathrm{CC}}=10.0 \mathrm{~V}$ | - | 2.0 | 20 | - | 40 | $\mu \mathrm{A}$ |
| $\mathrm{C}_{1}$ | input capacitance |  | - | 1.5 | - | - | - | pF |
| $\mathrm{C}_{\text {S(ON) }}$ | ON-state capacitance |  | - | 8 | - | - | - | pF |

Table 7. Static characteristics ...continued
Voltages are referenced to GND (ground $=0 \mathrm{~V}$ ).

| Symbol | Parameter | Conditions | $-40{ }^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C}$ to $+125{ }^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Min | Typ[]] | Max | Min | Max |  |
| 74HCT1G66 |  |  |  |  |  |  |  |  |
| $\mathrm{V}_{\mathrm{IH}}$ | HIGH-level input voltage | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | V |
| $\mathrm{V}_{\text {IL }}$ | LOW-level input voltage | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ to 5.5 V | 0.1 | 1.2 | 0.8 | - | 0.8 | V |
| 1 | input leakage current | $\mathrm{E} ; \mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}$ or GND; $\mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
| $I_{\text {S(OFF) }}$ | OFF-state leakage current | Y or Z ; $\mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}$; see $\underline{\text { Figure } 4}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
| $\mathrm{I}_{\text {(ON })}$ | ON-state leakage current | Y or $\mathrm{Z} ; \mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}$; see $\underline{\text { Figure } 5}$ | - | 0.1 | 1.0 | - | 1.0 | $\mu \mathrm{A}$ |
| $I_{\text {cc }}$ | supply current | $\begin{aligned} & \mathrm{E}, \mathrm{Y} \text { or } \mathrm{Z} ; \mathrm{V}_{1}=\mathrm{V}_{\mathrm{CC}} \text { or GND; } \\ & \mathrm{V}_{\mathrm{SW}}=\mathrm{GND} \text { or } \mathrm{V}_{\mathrm{CC}} ; \\ & \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} \text { to } 5.5 \mathrm{~V} \end{aligned}$ | - | 1 | 10 | - | 20 | $\mu \mathrm{A}$ |
| $\Delta l_{\text {cC }}$ | additional supply current | $\begin{aligned} & \mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}-2.1 \mathrm{~V} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} \text { to } 5.5 \mathrm{~V} ; \\ & \mathrm{I}_{\mathrm{O}}=0 \mathrm{~A} \end{aligned}$ | - | - | 500 | - | 850 | $\mu \mathrm{A}$ |
| C | input capacitance |  | - | 1.5 | - | - | - | pF |
| $\mathrm{C}_{\text {S(ON) }}$ | ON-state capacitance |  | - | 8 | - | - | - | pF |

[1] Typical values are measured at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}$.

### 10.1 Test circuits


$V_{I}=V_{C C}$ or $G N D$ and $V_{O}=G N D$ or $V_{C C}$.
Fig 4. Test circuit for measuring OFF-state leakage current

$\mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}$ or GND and $\mathrm{V}_{\mathrm{O}}=$ open circuit.
Fig 5. Test circuit for measuring ON -state leakage current

### 10.2 ON resistance

Table 8. ON resistance
At recommended operating conditions; voltages are referenced to GND (ground 0 V ); for graph see Figure 7.

| Symbol | Parameter | Conditions | $-40{ }^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Min | Typ[ ${ }^{[2]}$ | Max | Min | Max |  |
| 74HC1G66[1] |  |  |  |  |  |  |  |  |
| $\mathrm{R}_{\mathrm{ON}(\text { peak })}$ | ON resistance (peak) | $\mathrm{V}_{\mathrm{I}}=\mathrm{GND}$ to $\mathrm{V}_{\mathrm{CC}}$; see Figure 6 |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=0.1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | - | - | - | - | - | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 42 | 118 | - | 142 | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | - | 31 | 105 | - | 126 | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$ | - | 23 | 88 | - | 105 | $\Omega$ |
| $\mathrm{R}_{\mathrm{ON}(\text { rail }}$ | ON resistance (rail) | $\mathrm{V}_{\mathrm{I}}=\mathrm{GND} \text {; see Figure } 6$ |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=0.1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | - | 75 | - | - | - | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 29 | 95 | - | 115 | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | - | 23 | 82 | - | 100 | $\Omega$ |
|  |  | $\mathrm{I}_{\text {SW }}=1 \mathrm{~mA} ; \mathrm{V}_{\text {CC }}=9.0 \mathrm{~V}$ | - | 18 | 70 | - | 80 | $\Omega$ |
|  |  | $\mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\mathrm{CC}}$; see Figure 6 |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=0.1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ | - | 75 | - | - | - | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 35 | 106 | - | 128 | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ | - | 27 | 94 | - | 113 | $\Omega$ |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$ | - | 21 | 78 | - | 95 | $\Omega$ |
| 74HCT1G66 |  |  |  |  |  |  |  |  |
| $\mathrm{R}_{\mathrm{ON}(\text { peak })}$ | ON resistance (peak) | $\mathrm{V}_{1}=\mathrm{GND}$ to $\mathrm{V}_{\mathrm{CC}}$; see Figure 6 |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 42 | 118 | - | 142 | $\Omega$ |
| $\mathrm{R}_{\mathrm{ON}(\text { rail })}$ | ON resistance (rail) | $\mathrm{V}_{\mathrm{I}}=\mathrm{GND}$; see Figure 6 |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 29 | 95 | - | 115 | $\Omega$ |
|  |  | $V_{I}=V_{C C} ; \text { see Figure } 6$ |  |  |  |  |  |  |
|  |  | $\mathrm{I}_{\mathrm{SW}}=1 \mathrm{~mA} ; \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 35 | 106 | - | 128 | $\Omega$ |

[1] At supply voltages approaching 2 V , the ON resistance becomes extremely non-linear. Therefore it is recommended that these devices be used to transmit digital signals only, when using this supply voltage.
[2] Typical values are measured at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}$.

### 10.3 ON resistance test circuit and graphs


$\mathrm{R}_{\mathrm{ON}}=\mathrm{V}_{\mathrm{SW}} / \mathrm{I}_{\mathrm{SW}}$.
Fig 6. Test circuit for measuring ON resistance


Fig 7. Typical ON resistance as a function of input voltage

## 11. Dynamic characteristics

Table 9. Dynamic characteristics
Voltages are referenced to $G N D$ (ground $=0 \mathrm{~V}$ ); $C_{L}=50 \mathrm{pF} ; R_{L}=1 \mathrm{k} \Omega$, unless otherwise specified;
For test circuit see Figure 10.

| Symbol | Parameter | Conditions |  | $-40{ }^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |  |  | $-40^{\circ} \mathrm{C}$ to $+125{ }^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Min | Typ[1] | Max | Min | Max |  |
| 74HC1G66 |  |  |  |  |  |  |  |  |  |
| $\mathrm{t}_{\mathrm{pd}}$ | propagation delay | $\begin{aligned} & \mathrm{Y} \text { to } \mathrm{Z} \text { or } \mathrm{Z} \text { to } \mathrm{Y} ; \mathrm{R}_{\mathrm{L}}=\infty \Omega \text {; } \\ & \text { see Figure } 8 \end{aligned}$ | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ |  | - | 8 | 75 | - | 90 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ |  | - | 3 | 15 | - | 18 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ |  | - | 2 | 13 | - | 15 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$ |  | - | 1 | 10 | - | 12 | ns |
| $t_{\text {en }}$ | enable time | E to Y or Z ; see Figure 9 | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{C C}=2.0 \mathrm{~V}$ |  | - | 50 | 125 | - | 150 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ |  | - | 16 | 25 | - | 30 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V} ; \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ |  | - | 11 | - | - | - | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ |  | - | 13 | 21 | - | 26 | ns |
|  |  | $\mathrm{V}_{C C}=9.0 \mathrm{~V}$ |  | - | 9 | 16 | - | 20 | ns |

Table 9. Dynamic characteristics ...continued
Voltages are referenced to GND (ground $=0 \mathrm{~V}$ ); $C_{L}=50 \mathrm{pF} ; R_{L}=1 \mathrm{k} \Omega$, unless otherwise specified;
For test circuit see Figure 10.

| Symbol | Parameter | Conditions |  | $-40^{\circ} \mathrm{C}$ to $+85^{\circ} \mathrm{C}$ |  |  | $-40{ }^{\circ} \mathrm{C}$ to $+125{ }^{\circ} \mathrm{C}$ |  | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Min | Typ[1] | Max | Min | Max |  |
| $\mathrm{t}_{\text {dis }}$ | disable time | E to Y or Z ; see $\underline{\text { Figure } 9}$ | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=2.0 \mathrm{~V}$ |  | - | 27 | 190 | - | 225 | ns |
|  |  | $\mathrm{V}_{C C}=4.5 \mathrm{~V}$ |  | - | 16 | 38 | - | 45 | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=5.0 \mathrm{~V} ; \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ |  | - | 11 | - | - | - | ns |
|  |  | $\mathrm{V}_{\mathrm{CC}}=6.0 \mathrm{~V}$ |  | - | 14 | 33 | - | 38 | ns |
|  |  | $\mathrm{V}_{C C}=9.0 \mathrm{~V}$ |  | - | 12 | 16 | - | 20 | ns |
| $\mathrm{C}_{\text {PD }}$ | power dissipation capacitance | $\mathrm{V}_{1}=\mathrm{GND}$ to $\mathrm{V}_{\mathrm{CC}}$ | [3] | - | 9 | - | - | - | pF |
| 74HCT1G66 |  |  |  |  |  |  |  |  |  |
| $\mathrm{t}_{\mathrm{pd}}$ | propagation delay | $Y$ to $Z$ or $Z$ to $Y ; R_{L}=\infty \Omega$; see Figure 8 | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{C C}=4.5 \mathrm{~V}$ |  | - | 3 | 15 | - | 18 | ns |
| $\mathrm{t}_{\text {en }}$ | enable time | E to Y or Z ; see Figure 9 | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{C C}=4.5 \mathrm{~V}$ |  | - | 15 | 30 | - | 36 | ns |
|  |  | $\mathrm{V}_{C C}=5.0 \mathrm{~V} ; \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ |  | - | 12 | - | - | - | ns |
| $\mathrm{t}_{\text {dis }}$ | disable time | E to Y or Z ; see Figure 9 | [2] |  |  |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ |  | - | 13 | 44 | - | 53 | ns |
|  |  | $\mathrm{V}_{C C}=5.0 \mathrm{~V} ; \mathrm{C}_{\mathrm{L}}=15 \mathrm{pF}$ |  | - | 12 | - | - | - | ns |
| $\mathrm{C}_{\text {PD }}$ | power dissipation capacitance | $\mathrm{V}_{\mathrm{I}}=\mathrm{GND}$ to $\mathrm{V}_{\mathrm{CC}}-1.5 \mathrm{~V}$ | [3] | - | 9 | - | - | - | pF |

[1] All typical values are measured at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}$.
[2] $t_{p d}$ is the same as $t_{\text {PLH }}$ and $t_{\text {PHL }}$. $t_{\text {en }}$ is the same as $t_{P Z L}$ and $t_{P Z H}$. $t_{\text {dis }}$ is the same as $t_{P L Z}$ and $t_{P H Z}$.
[3] $C_{P D}$ is used to determine the dynamic power dissipation $P_{D}(\mu W)$.
$P_{D}=C_{P D} \times V_{C C}{ }^{2} \times f_{i}+\Sigma\left(\left(C_{L} \times C_{S W}\right) \times V_{C C}{ }^{2} \times f_{0}\right)$ where:
$\mathrm{f}_{\mathrm{i}}=$ input frequency in MHz ;
$\mathrm{f}_{\mathrm{o}}=$ output frequency in MHz ;
$\mathrm{C}_{\mathrm{L}}=$ output load capacitance in pF;
$\mathrm{C}_{\mathrm{SW}}=$ maximum switch capacitance in pF (see Table 7);
$\mathrm{V}_{\mathrm{CC}}=$ supply voltage in Volt;
$\Sigma\left(\left(C_{L} \times C_{S W}\right) \times V_{C C}{ }^{2} \times f_{0}\right)=$ sum of outputs.

### 11.1 Waveforms and test circuit



Measurement points are given in Table 10.
Logic levels: $\mathrm{V}_{\mathrm{OL}}$ and $\mathrm{V}_{\mathrm{OH}}$ are typical output voltage levels that occur with the output load.
Fig 8. Input ( Y or Z ) to output ( Z or Y ) propagation delays


Measurement points are given in Table 10.
Logic levels: $\mathrm{V}_{\mathrm{OL}}$ and $\mathrm{V}_{\text {OH }}$ are typical output voltage levels that occur with the output load.
Fig 9. Enable and disable times

Table 10. Measurement points

| Type | Input | Output |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | $\mathbf{V}_{\mathbf{M}}$ | $\mathbf{V}_{\mathbf{M}}$ | $\mathbf{V}_{\mathbf{X}}$ | $\mathbf{V}_{\mathbf{Y}}$ |
| 74HC1G66 | $0.5 \mathrm{~V}_{\mathrm{CC}}$ | $0.5 \mathrm{~V}_{\mathrm{CC}}$ | $\mathrm{V}_{\mathrm{OL}}+10 \%$ | $\mathrm{~V}_{\mathrm{OH}}-10 \%$ |
| 74 HCT 1 G 66 | 1.3 V | 1.3 V | $\mathrm{~V}_{\mathrm{OL}}+10 \%$ | $\mathrm{~V}_{\mathrm{OH}}-10 \%$ |



Test data is given in Table 11.
Definitions for test circuit:
$R_{T}=$ Termination resistance should be equal to output impedance $Z_{o}$ of the pulse generator.
$C_{L}=$ Load capacitance including jig and probe capacitance.
$R_{L}=$ Load resistance.
S1 = Test selection switch.
Fig 10. Test circuit for measuring switching times

Table 11. Test data

| Type | Input |  | Load |  | S1 position |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{V}_{1}$ | $\mathrm{t}_{\mathrm{r}}, \mathrm{t}_{\mathrm{f}}{ }^{[1]}$ | $\mathrm{C}_{\mathrm{L}}$ | $\mathbf{R}_{\mathrm{L}}$ | $\mathrm{t}_{\text {PHL }}, \mathrm{t}_{\text {PLH }}$ | $\mathrm{t}_{\text {PZH }}, \mathrm{t}_{\text {PHZ }}$ | $\mathrm{t}_{\text {PZL }}, \mathrm{t}_{\text {PLZ }}$ |
| 74HC1G66 | GND to $\mathrm{V}_{\text {Cc }}$ | 6 ns | $50 \mathrm{pF}, 15 \mathrm{pF}$ | $1 \mathrm{k} \Omega, \infty \Omega$ | open | GND | $V_{\text {CC }}$ |
| 74HCT1G66 | GND to 3 V | 6 ns | $50 \mathrm{pF}, 15 \mathrm{pF}$ | $1 \mathrm{k} \Omega, \infty \Omega$ | open | GND | $\mathrm{V}_{\mathrm{CC}}$ |

[1] There is no constraint on $t_{r}$, $t_{f}$ with a $50 \%$ duty factor when measuring $f_{\text {max }}$.

### 11.2 Additional dynamic characteristics

Table 12. Additional dynamic characteristics for 74HC1G66 and 74HCT1G66
$G N D=0 \mathrm{~V} ; t_{r}=t_{f}=6.0 \mathrm{~ns} ; C_{L}=50 \mathrm{pF}$; unless otherwise specified. All typical values are measured at $T_{\text {amb }}=25^{\circ} \mathrm{C}$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| THD | total harmonic distortion | $\mathrm{f}_{\mathrm{i}}=1 \mathrm{kHz} ; \mathrm{R}_{\mathrm{L}}=10 \mathrm{k} \Omega$; see Figure 11 |  |  |  | \% |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} ; \mathrm{V}_{\mathrm{I}}=4.0 \mathrm{~V}$ (p-p) | - | 0.04 | - | \% |
|  |  | $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V} ; \mathrm{V}_{\mathrm{I}}=8.0 \mathrm{~V}$ (p-p) | - | 0.02 | - | \% |
|  |  | $\mathrm{f}_{\mathrm{i}}=10 \mathrm{kHz} ; \mathrm{R}_{\mathrm{L}}=10 \mathrm{k} \Omega$; see Figure 11 |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} ; \mathrm{V}_{\mathrm{I}}=4.0 \mathrm{~V}$ (p-p) | - | 0.12 | - | \% |
|  |  | $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V} ; \mathrm{V}_{\mathrm{I}}=8.0 \mathrm{~V}$ (p-p) | - | 0.06 | - | \% |

Table 12. Additional dynamic characteristics for 74HC1G66 and 74HCT1G66 ...continued $G N D=0 \mathrm{~V} ; t_{r}=t_{f}=6.0 \mathrm{~ns} ; C_{L}=50 \mathrm{pF}$; unless otherwise specified. All typical values are measured at $T_{\text {amb }}=25^{\circ} \mathrm{C}$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{f}_{(-3 \mathrm{~dB})}$ | -3 dB frequency response | $\mathrm{R}_{\mathrm{L}}=50 \Omega ; \mathrm{C}_{\mathrm{L}}=10 \mathrm{pF}$; see Figure 12 and $\underline{13}$ |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | 180 | - | MHz |
|  |  | $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$ | - | 200 | - | MHz |
| $\alpha_{\text {iso }}$ | isolation (OFF-state) | $\mathrm{R}_{\mathrm{L}}=600 \Omega ; \mathrm{f}_{\mathrm{i}}=1 \mathrm{MHz}$; see Figure 14 and $\underline{15}$ |  |  |  |  |
|  |  | $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$ | - | -50 | - | dB |
|  |  | $\mathrm{V}_{\mathrm{CC}}=9.0 \mathrm{~V}$ | - | -50 | - | dB |

### 11.3 Test circuits and graphs



Fig 11. Test circuit for measuring total harmonic distortion


With $f_{i}=1 \mathrm{MHz}$ adjust the switch input voltage for a 0 dBm level at the switch output, ( $0 \mathrm{dBm}=1 \mathrm{~mW}$ into $50 \Omega$ ). Then Increase the input frequency until the dB meter reads -3 dB
Fig 12. Test circuit for measuring the -3 dB frequency response


Test conditions: $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V}$; GND $=0 \mathrm{~V} ; \mathrm{R}_{\mathrm{L}}=50 \Omega$; $\mathrm{R}_{\text {SOURCE }}=1 \mathrm{k} \Omega$.
Fig 13. Typical -3 dB frequency response


Adjust the switch input voltage for a 0 dBm level, $(0 \mathrm{dBm}=1 \mathrm{~mW}$ into $600 \Omega)$
Fig 14. Test circuit for measuring isolation (OFF-state)


Test conditions: $\mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} ; \mathrm{GND}=0 \mathrm{~V} ; \mathrm{R}_{\mathrm{L}}=50 \Omega ; \mathrm{R}_{\text {SOURCE }}=1 \mathrm{k} \Omega$.
Fig 15. Typical isolation (OFF-state) as a function of frequency

## 12. Package outline



DIMENSIONS (mm are the original dimensions)

| UNIT | $\mathbf{A}$ <br> $\mathbf{m a x}$. | $\mathbf{A}_{\mathbf{1}}$ | $\mathbf{A}_{\mathbf{2}}$ | $\mathbf{A}_{\mathbf{3}}$ | $\mathbf{b}_{\mathbf{p}}$ | $\mathbf{c}$ | $\mathbf{D}^{(1)}$ | $\mathbf{E}^{(\mathbf{1})}$ | $\mathbf{e}$ | $\mathbf{e}_{\mathbf{1}}$ | $\mathbf{H}_{\mathbf{E}}$ | $\mathbf{L}$ | $\mathbf{L}_{\mathbf{p}}$ | $\mathbf{v}$ | $\mathbf{w}$ | $\mathbf{y}$ | $\mathbf{Z}^{(1)}$ | $\boldsymbol{\theta}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | 1.1 | 0.1 | 1.0 | 0.15 | 0.30 | 0.25 | 2.25 | 1.35 | 0.65 | 1.3 | 2.25 | 0.425 | 0.46 |  |  |  |  |  |
|  | 0.8 | 0.15 | 0.15 | 0.08 | 1.85 | 1.15 | 0.3 | 0.1 | 0.1 | 0.60 | $7^{\circ}$ |  |  |  |  |  |  |  |
| 0.15 | $0^{\circ}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |  |  | EUROPEAN PROJECTION | ISSUE DATE |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | IEC | JEDEC | JEITA |  |  |
| SOT353-1 |  | MO-203 | SC-88A |  | $\begin{aligned} & \hline 00-09-01 \\ & 03-02-19 \\ & \hline \end{aligned}$ |

Fig 16. Package outline SOT353-1 (TSSOP5)
74HC_HCT1G66_4

detail X
DIMENSIONS (mm are the original dimensions)

| UNIT | $\mathbf{A}$ | $\mathbf{A}_{\mathbf{1}}$ | $\mathbf{b p}$ | $\mathbf{c}$ | $\mathbf{D}$ | $\mathbf{E}$ | $\mathbf{e}$ | $\mathbf{H}_{\mathbf{E}}$ | $\mathbf{L}_{\mathbf{p}}$ | $\mathbf{Q}$ | $\mathbf{v}$ | $\mathbf{w}$ | $\mathbf{y}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mm | 1.1 | 0.100 | 0.40 | 0.26 | 3.1 | 1.7 | 0.95 | 3.0 <br> 2.5 | 0.6 <br> 0.2 | 0.33 <br> 0.23 | 0.2 | 0.2 | 0.1 |


| OUTLINE <br> VERSION | REFERENCES |  |  |  | EUROPEAN <br> PROJECTION | ISSUE DATE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | IEC | JEDEC | JEITA |  |  |  |
| SOT753 |  |  | SC-74A |  | - |  |

Fig 17. Package outline SOT753 (SC-74A)

## 13. Abbreviations

Table 13. Abbreviations

| Acronym | Description |
| :--- | :--- |
| CMOS | Complementary Metal-Oxide Semiconductor |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |
| DUT | Device Under Test |

## 14. Revision history

Table 14. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
| :--- | :--- | :--- | :--- | :--- |
| 74HC_HCT1G66_4 | 20081219 | Product data sheet | - | 74HC_HCT1G66_3 |
| Modifications: | $\bullet$ | The format of this data sheet has been redesigned to comply with the new identity |  |  |
|  | guidelines of NXP Semiconductors. |  |  |  |

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| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
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