

# 74HC4066-Q100; 74HCT4066-Q100

Quad single-pole single-throw analog switch

Rev. 3 — 16 December 2013

Product data sheet

## 1. General description

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The 74HC4066-Q100; 74HCT4066-Q100 is a quad single pole, single throw analog switch. Each switch features two input/output terminals (nY and nZ) and an active HIGH enable input (nE). When nE is LOW, the analog switch is turned off. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

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- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- Input levels nE inputs:
  - ◆ For 74HC4066-Q100: CMOS level
  - ◆ For 74HCT4066-Q100: TTL level
- Low ON resistance:
  - ◆  $50\ \Omega$  (typical) at  $V_{CC} = 4.5\text{ V}$
  - ◆  $45\ \Omega$  (typical) at  $V_{CC} = 6.0\text{ V}$
  - ◆  $35\ \Omega$  (typical) at  $V_{CC} = 9.0\text{ V}$
- Specified in compliance with JEDEC standard no. 7A
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\ \Omega$ )
- Multiple package options



## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC4066D-Q100 74HCT4066D-Q100	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HC4066PW-Q100 74HCT4066PW-Q100	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74HC4066BQ-Q100 74HCT4066BQ-Q100	-40 °C to +125 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm	SOT762-1

## 4. Functional diagram

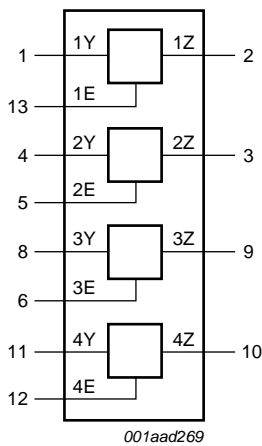


Fig 1. Logic symbol

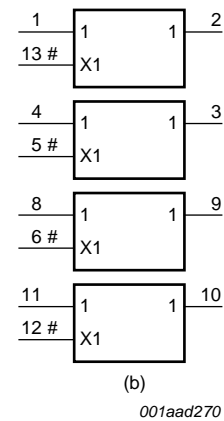
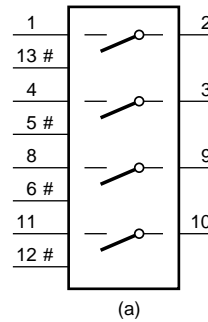


Fig 2. IEC logic symbol

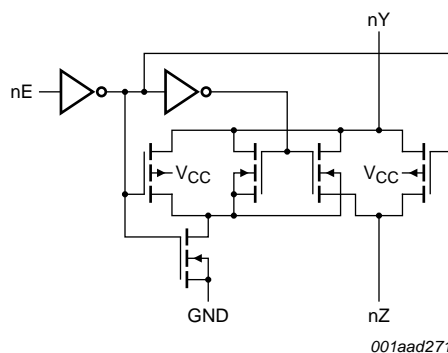
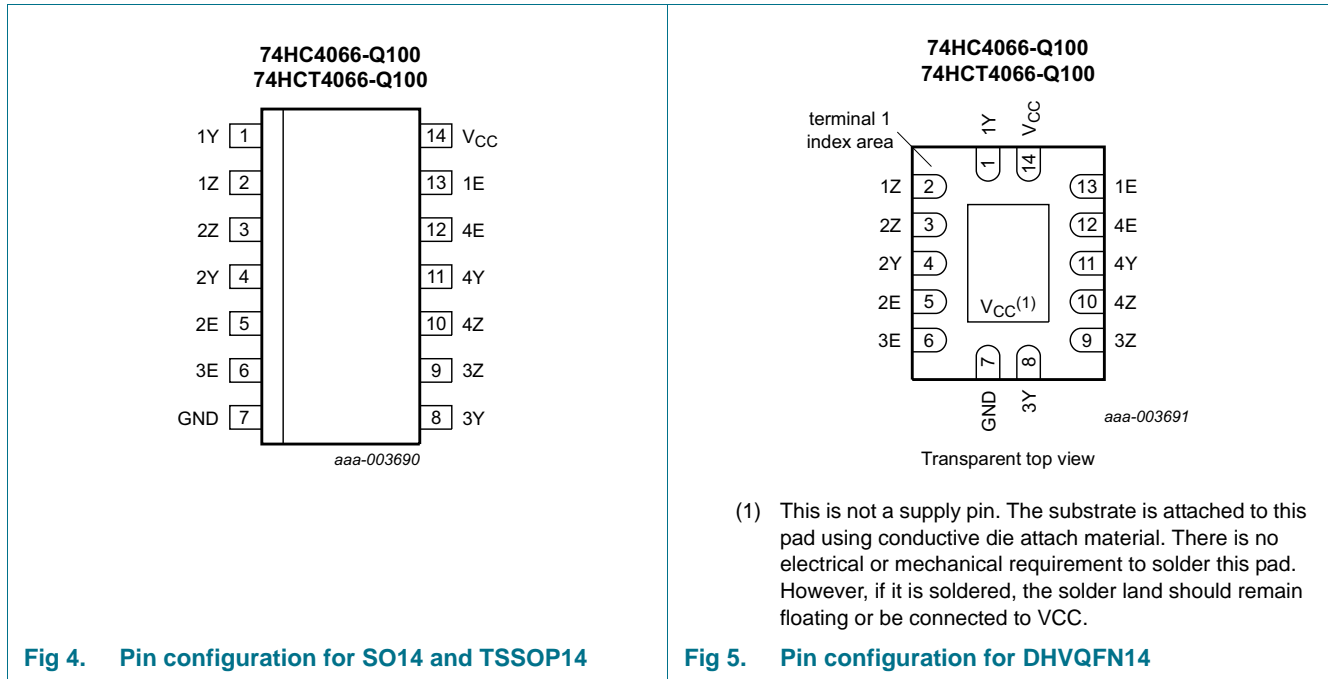


Fig 3. Schematic diagram (one switch)

## 5. Pinning information

### 5.1 Pinning



### 5.2 Pin description

**Table 2. Pin description**

Symbol	Pin	Description
1Z, 2Z, 3Z, 4Z	2, 3, 9, 10	independent input or output
1Y, 2Y, 3Y, 4Y	1, 4, 8, 11	independent input or output
GND	7	ground (0 V)
1E, 2E, 3E, 4E	13, 5, 6, 12	enable input (active HIGH)
V <sub>CC</sub>	14	supply voltage

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

Input nE	Switch
L	OFF
H	ON

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

## 7. Limiting values

Table 4. 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
$V_{CC}$	supply voltage		-0.5	+11.0	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{SK}$	switch clamping current	$V_{SW} < -0.5\text{ V}$ or $V_{SW} > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{SW}$	switch current	$V_{SW} = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$	<sup>[1]</sup> -	$\pm 25$	mA
$I_{CC}$	supply current		-	50	mA
$I_{GND}$	ground current		-	-50	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$	<sup>[2]</sup>	-	500
P	power dissipation	per switch	-	100	mW

- [1] To avoid drawing  $V_{CC}$  current out of terminal Z, when switch current flows in terminals Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no  $V_{CC}$  current will flow out of terminals Yn. In this case there is no limit for the voltage drop across the switch, but the voltages at Yn and Z may not exceed  $V_{CC}$  or GND.
- [2] For SO14 packages:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.  
For TSSOP14 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.  
For DHVQFN14 packages:  $P_{tot}$  derates linearly with 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	74HC4066-Q100			74HCT4066-Q100			Unit
			Min	Typ	Max	Min	Typ	Max	
$V_{CC}$	supply voltage		2.0	5.0	10.0	4.5	5.0	5.5	V
$V_I$	input voltage		GND	-	$V_{CC}$	GND	-	$V_{CC}$	V
$V_{SW}$	switch voltage		GND	-	$V_{CC}$	GND	-	$V_{CC}$	V
$T_{amb}$	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5\text{ V}$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	-	-	-	ns/V
		$V_{CC} = 10.0\text{ V}$	-	-	35	-	-	-	ns/V

## 9. Static characteristics

**Table 6.** R<sub>ON</sub> resistance per switch for types 74HC4066-Q100 and 74HCT4066-Q100

$V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see [Figure 6](#).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

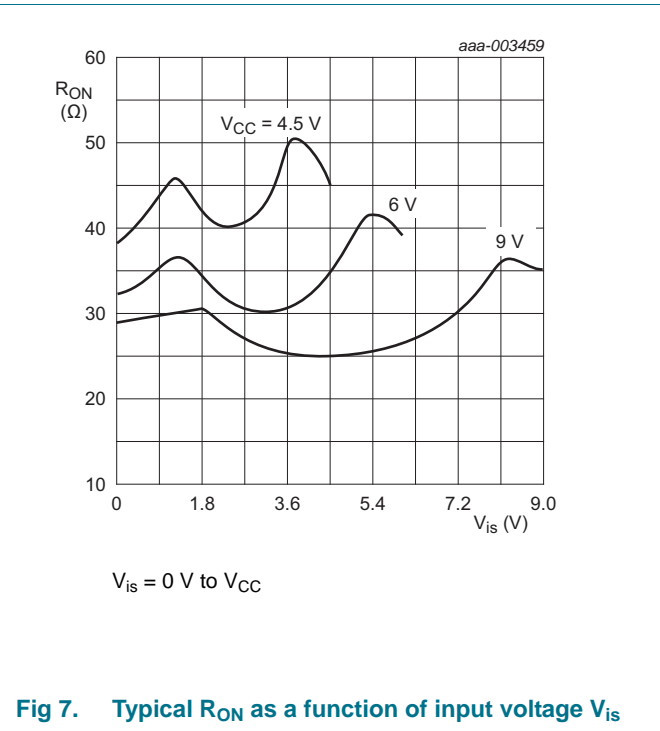
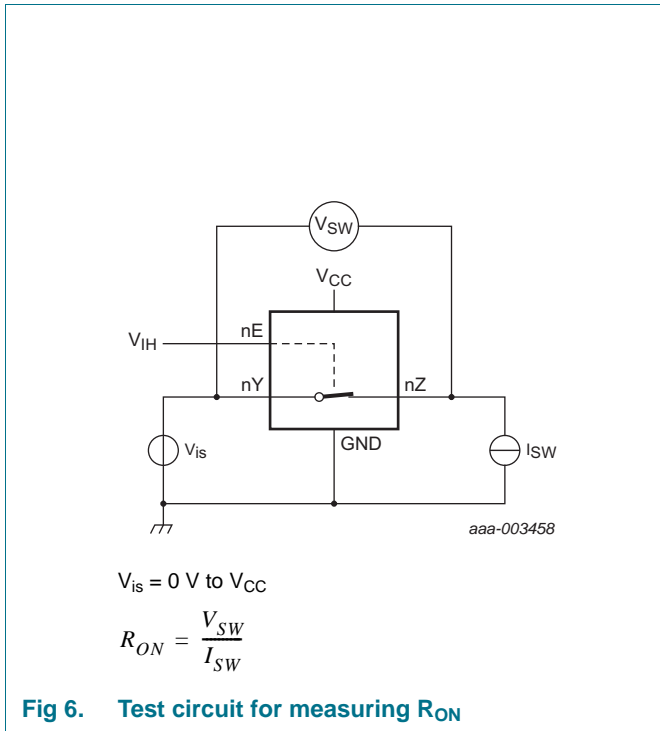
For 74HC4066-Q100:  $V_{CC} - GND = 2.0\text{ V}, 4.5\text{ V}, 6.0\text{ V}$  and  $9.0\text{ V}$ .

For 74HCT4066-Q100:  $V_{CC} - GND = 4.5\text{ V}$ .

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
R <sub>ON(peak)</sub>	ON resistance (peak)	V <sub>is</sub> = V <sub>CC</sub> to GND						
		V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 100 μA <sup>[2]</sup>	-	-	-	-	-	Ω
		V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 μA	-	54	-	118	142	Ω
		V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 μA	-	42	-	105	126	Ω
		V <sub>CC</sub> = 9.0 V; I <sub>SW</sub> = 1000 μA	-	32	-	88	105	Ω
R <sub>ON(rail)</sub>	ON resistance (rail)	V <sub>is</sub> = GND						
		V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 100 μA <sup>[2]</sup>	-	80	-	-	-	Ω
		V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 μA	-	35	-	95	115	Ω
		V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 μA	-	27	-	82	100	Ω
		V <sub>CC</sub> = 9.0 V; I <sub>SW</sub> = 1000 μA	-	20	-	70	85	Ω
		V <sub>is</sub> = V <sub>CC</sub>						
		V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 100 μA <sup>[2]</sup>	-	100	-	-	-	Ω
		V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 μA	-	42	-	106	128	Ω
		V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 μA	-	35	-	94	113	Ω
		V <sub>CC</sub> = 9.0 V; I <sub>SW</sub> = 1000 μA	-	20	-	78	95	Ω
ΔR <sub>ON</sub>	ON resistance mismatch between channels	V <sub>is</sub> = V <sub>CC</sub> to GND						
		V <sub>CC</sub> = 2.0 V <sup>[2]</sup>	-	-	-	-	-	Ω
		V <sub>CC</sub> = 4.5 V	-	5	-	-	-	Ω
		V <sub>CC</sub> = 6.0 V	-	4	-	-	-	Ω
		V <sub>CC</sub> = 9.0 V	-	3	-	-	-	Ω

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

[2] At supply voltages (V<sub>CC</sub> - GND) approaching 2 V, the analog switch ON resistance becomes extremely non-linear. Therefore it is recommended that these devices be used to transmit digital signals only, when using these supply voltages.



**Table 7. Static characteristics 74HC4066-Q100**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ <sup>U</sup>	Max	Unit
$T_{amb} = -40 \text{ °C to } +85 \text{ °C}$						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0 \text{ V}$	1.5	1.2	-	V
		$V_{CC} = 4.5 \text{ V}$	3.15	2.4	-	V
		$V_{CC} = 6.0 \text{ V}$	4.2	3.2	-	V
		$V_{CC} = 9.0 \text{ V}$	6.3	4.7	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0 \text{ V}$	-	0.8	0.5	V
		$V_{CC} = 4.5 \text{ V}$	-	2.1	1.35	V
		$V_{CC} = 6.0 \text{ V}$	-	2.8	1.80	V
		$V_{CC} = 9.0 \text{ V}$	-	4.3	2.70	V
$I_I$	input leakage current	$V_I = V_{CC} \text{ or } GND$				
		$V_{CC} = 6.0 \text{ V}$	-	-	$\pm 1.0$	$\mu A$
		$V_{CC} = 10.0 \text{ V}$	-	-	$\pm 2.0$	$\mu A$
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0 \text{ V}; V_I = V_{IH} \text{ or } V_{IL};$ $ V_{SW}  = V_{CC} - GND$ ; see <a href="#">Figure 8</a>				
		per channel	-	-	$\pm 1.0$	$\mu A$
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 10.0 \text{ V}; V_I = V_{IH} \text{ or } V_{IL};$ $ V_{SW}  = V_{CC} - GND$ ; see <a href="#">Figure 9</a>			$\pm 1.0$	$\mu A$

**Table 7. Static characteristics 74HC4066-Q100 ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $V_{is} =$ GND or $V_{CC}$ ; $V_{os} = V_{CC}$ or GND				
		$V_{CC} = 6.0$ V	-	-	20.0	$\mu$ A
		$V_{CC} = 10.0$ V	-	-	40.0	$\mu$ A
$C_I$	input capacitance		-	3.5	-	pF
$C_{SW}$	switch capacitance		-	8	-	pF
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0$ V	1.5	-	-	V
		$V_{CC} = 4.5$ V	3.15	-	-	V
		$V_{CC} = 6.0$ V	4.2	-	-	V
		$V_{CC} = 9.0$ V	6.3	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0$ V	-	-	0.50	V
		$V_{CC} = 4.5$ V	-	-	1.35	V
		$V_{CC} = 6.0$ V	-	-	1.80	V
		$V_{CC} = 9.0$ V	-	-	2.70	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND				
		$V_{CC} = 6.0$ V	-	-	$\pm 1.0$	$\mu$ A
		$V_{CC} = 10.0$ V	-	-	$\pm 2.0$	$\mu$ A
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0$ V; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} -$ GND; see <a href="#">Figure 8</a>				
		per channel	-	-	$\pm 1.0$	$\mu$ A
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 10.0$ V; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} -$ GND; see <a href="#">Figure 9</a>	-	-	$\pm 1.0$	$\mu$ A
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $V_{is} =$ GND or $V_{CC}$ ; $V_{os} = V_{CC}$ or GND				
		$V_{CC} = 6.0$ V	-	-	40	$\mu$ A
		$V_{CC} = 10.0$ V	-	-	80	$\mu$ A

[1] Typical values are measured at  $T_{amb} = 25$  °C.

**Table 8. Static characteristics 74HCT4066-Q100**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V	2.0	1.6	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V	-	1.2	0.8	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 1.0$	$\mu$ A

**Table 8. Static characteristics 74HCT4066-Q100 ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a> per channel	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a>	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $V_{is} = \text{GND}$ or $V_{CC}$ ; $V_{os} = V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	-	20.0	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = V_{CC} - 2.1\text{ V}$ ; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	100	450	$\mu\text{A}$
$C_I$	input capacitance		-	3.5	-	pF
$C_{SW}$	switch capacitance		-	8	-	pF
<b><math>T_{amb} = -40\text{ }^\circ\text{C}</math> to <math>+125\text{ }^\circ\text{C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	2.0	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	-	0.8	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a> per channel	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 5.5\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a>	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $V_{is} = \text{GND}$ or $V_{CC}$ ; $V_{os} = V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	-	40	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = V_{CC} - 2.1\text{ V}$ ; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$	-	-	490	$\mu\text{A}$

[1] Typical values are measured at  $T_{amb} = 25\text{ }^\circ\text{C}$ .

$V_{is} = V_{CC}$  and  $V_{os} = \text{GND}$   
 $V_{is} = \text{GND}$  and  $V_{os} = V_{CC}$

**Fig 8. Test circuit for measuring OFF-state leakage current**

$V_{is} = V_{CC}$  and  $V_{os} = \text{open}$   
 $V_{is} = \text{GND}$  and  $V_{os} = \text{open}$

**Fig 9. Test circuit for measuring ON-state leakage current**



## 10. Dynamic characteristics

**Table 9. Dynamic characteristics 74HC4066-Q100**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$  unless specified otherwise; for test circuit see [Figure 12](#).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	−40 °C to +85 °C			−40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$t_{pd}$	propagation delay	nY to nZ or nZ to nY; $R_L = \infty\ \Omega$ ; see <a href="#">Figure 10</a> <sup>[2]</sup>						
		$V_{CC} = 2.0\text{ V}$	-	8	75	-	90	ns
		$V_{CC} = 4.5\text{ V}$	-	3	15	-	18	ns
		$V_{CC} = 6.0\text{ V}$	-	2	13	-	15	ns
		$V_{CC} = 9.0\text{ V}$	-	2	10	-	12	ns
$t_{off}$	turn-off time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>						
		$V_{CC} = 2.0\text{ V}$	-	44	190	-	225	ns
		$V_{CC} = 4.5\text{ V}$	-	16	38	-	45	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	13	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	-	13	33	-	38	ns
$t_{on}$	turn-on time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>						
		$V_{CC} = 2.0\text{ V}$	-	36	125	-	150	ns
		$V_{CC} = 4.5\text{ V}$	-	13	25	-	30	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	11	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	-	10	21	-	26	ns
$C_{PD}$	power dissipation capacitance	per switch; $V_I = GND$ to $V_{CC}$ <sup>[5]</sup>	11		-	-	-	pF

[1] Typical values are measured at  $T_{amb} = 25\text{ °C}$ .

[2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

[3]  $t_{on}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

[4]  $t_{off}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$$
 where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$\sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  = sum of outputs;

$C_L$  = output load capacitance in pF;

$C_{sw}$  = switch capacitance in pF;

$V_{CC}$  = supply voltage in V.

**Table 10. Dynamic characteristics 74HCT4066-Q100**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$  unless specified otherwise; for test circuit see [Figure 12](#).

$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$t_{pd}$	propagation delay	nY to nZ or nZ to nY; $R_L = \infty\ \Omega$ ; see <a href="#">Figure 10</a> <sup>[2]</sup>						
		$V_{CC} = 4.5\text{ V}$	-	3	15	-	18	ns
$t_{off}$	turn-off time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>						
		$V_{CC} = 4.5\text{ V}$	-	20	44	-	53	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	16	-	-	-	ns
$t_{on}$	turn-on time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>						
		$V_{CC} = 4.5\text{ V}$	-	12	30	-	36	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	12	-	-	-	ns
$C_{PD}$	power dissipation capacitance	per switch; $V_I = GND$ to $(V_{CC} - 1.5\text{ V})$ <sup>[5]</sup>	-	12	-	-	-	pF

[1] Typical values are measured at  $T_{amb} = 25\text{ °C}$ .

[2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

[3]  $t_{on}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

[4]  $t_{off}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

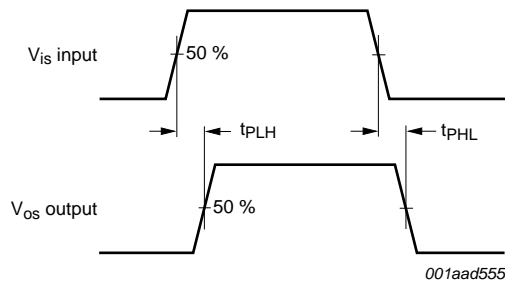
$\sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  = sum of outputs;

$C_L$  = output load capacitance in pF;

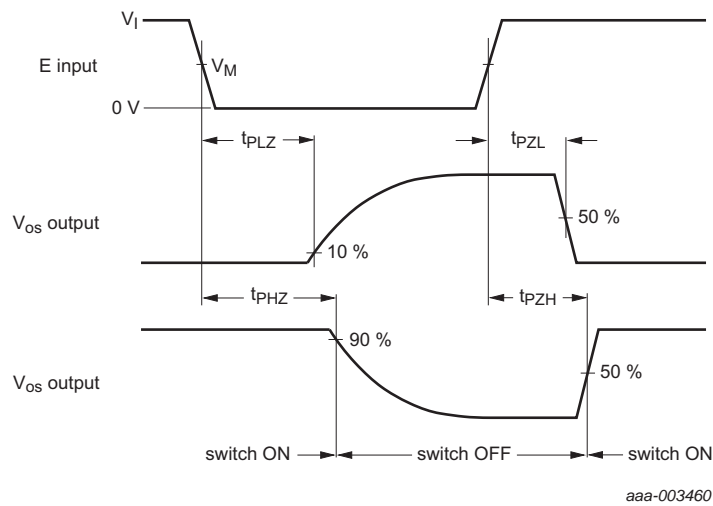
$C_{sw}$  = switch capacitance in pF;

$V_{CC}$  = supply voltage in V.

## 11. Waveforms



**Fig 10. Input ( $V_{is}$ ) to output ( $V_{os}$ ) propagation delays**

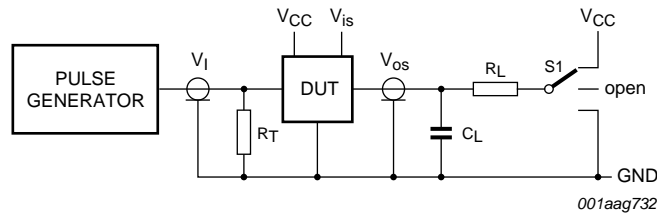
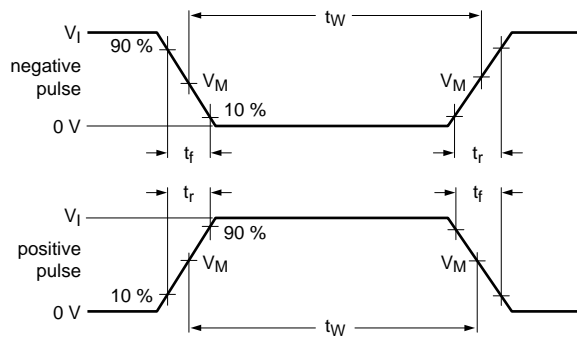


Measurement points are shown in [Table 11](#).

**Fig 11. Turn-on and turn-off times**

**Table 11. Measurement points**

Type	$V_I$	$V_M$
74HC4066-Q100	$V_{CC}$	$0.5V_{CC}$
74HCT4066-Q100	3.0 V	1.3 V



Test data is given in [Table 12](#).

Definitions 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 resistor.

S1 = Test selection switch.

**Fig 12. Load circuitry for measuring switching times**

**Table 12. Test data**

Test	Input			Output		S1 position
	Control E	Switch Yn (Z)	$t_r, t_f$	Switch Z (Yn)		
	$V_I$ <sup>[1]</sup>	$V_{is}$		$C_L$	$R_L$	
$t_{PHL}, t_{PLH}$	GND	GND to $V_{CC}$	6 ns	50 pF	-	open
$t_{PHZ}, t_{PZH}$	GND to $V_{CC}$	$V_{CC}$	6 ns	50 pF, 15 pF	1 k $\Omega$	GND
$t_{PLZ}, t_{PZL}$	GND to $V_{CC}$	GND	6 ns	50 pF, 15 pF	1 k $\Omega$	$V_{CC}$

[1] For 74HCT4066-Q100: maximum input voltage  $V_I = 3.0$  V.

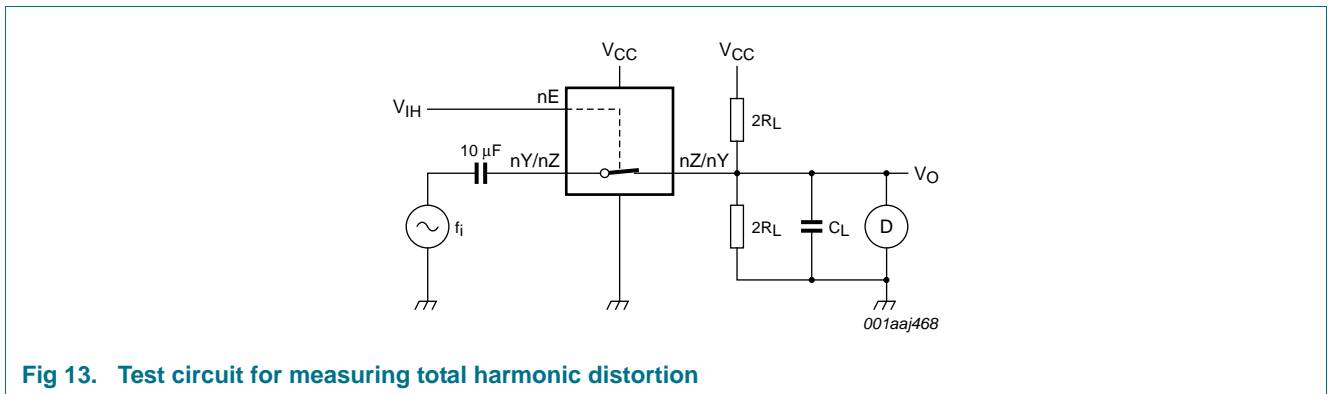
## 12. Additional dynamic characteristics

**Table 13. Additional dynamic characteristics**

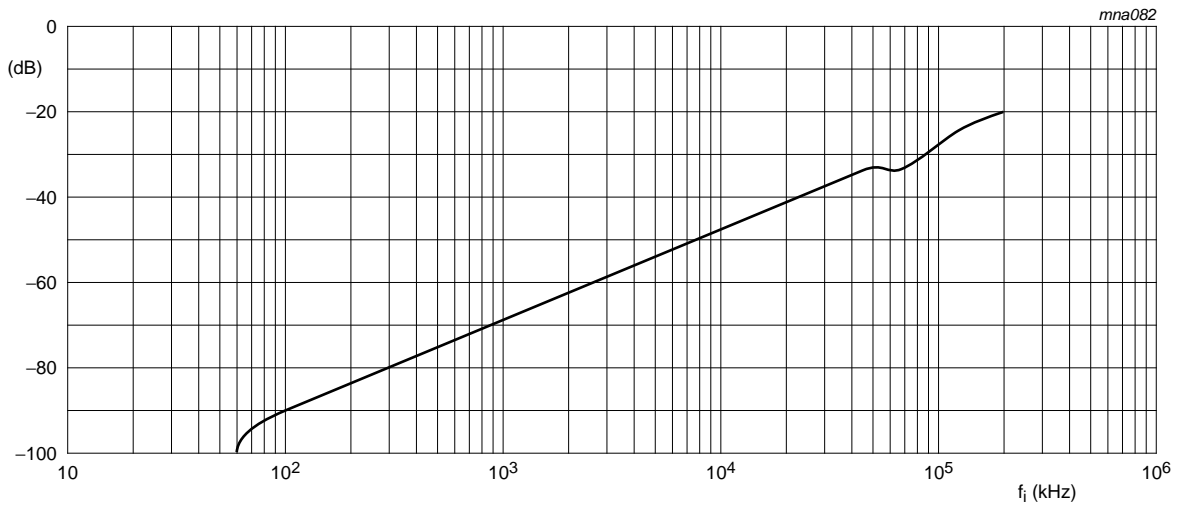
Recommended conditions and typical values;  $GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$ .  
 $V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.  
 $V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
THD	total harmonic distortion	$f_i = 1\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ; see <a href="#">Figure 13</a>				%
		$V_{CC} = 4.5\text{ V}$ ; $V_I = 4.0\text{ V (p-p)}$	-	0.04	-	%
		$V_{CC} = 9.0\text{ V}$ ; $V_I = 8.0\text{ V (p-p)}$	-	0.02	-	%
		$f_i = 10\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ; see <a href="#">Figure 13</a>				
		$V_{CC} = 4.5\text{ V}$ ; $V_I = 4.0\text{ V (p-p)}$	-	0.12	-	%
		$V_{CC} = 9.0\text{ V}$ ; $V_I = 8.0\text{ V (p-p)}$	-	0.06	-	%
$f_{(-3dB)}$	-3 dB frequency response	$R_L = 50\text{ }\Omega$ ; $C_L = 10\text{ pF}$ ; see <a href="#">Figure 15</a>	<a href="#">[2]</a>			
		$V_{CC} = 4.5\text{ V}$	-	180	-	MHz
		$V_{CC} = 9.0\text{ V}$	-	200	-	MHz
$\alpha_{iso}$	isolation (OFF-state)	$R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; see <a href="#">Figure 14</a>	<a href="#">[1]</a>			
		$V_{CC} = 4.5\text{ V}$	-	-50	-	dB
		$V_{CC} = 9.0\text{ V}$	-	-50	-	dB
$V_{ct}$	crosstalk voltage	between digital input and switch (peak to peak value); $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; see <a href="#">Figure 16</a>				
		$V_{CC} = 4.5\text{ V}$	-	110	-	mV
		$V_{CC} = 9.0\text{ V}$	-	220	-	mV
Xtalk	crosstalk	between switches; $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ; see <a href="#">Figure 17</a>	<a href="#">[1]</a>			
		$V_{CC} = 4.5\text{ V}$	-	-60	-	dB
		$V_{CC} = 9.0\text{ V}$	-	-60	-	dB

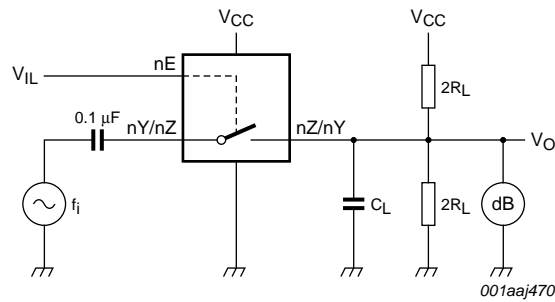
- [1] Adjust input voltage  $V_{is}$  to 0 dBm level (0 dBm = 1 mW into 600  $\Omega$ ).
- [2] Adjust input voltage  $V_{is}$  to 0 dBm level at  $V_{os}$  for  $f_i = 1\text{ MHz}$  (0 dBm = 1 mW into 50  $\Omega$ ). After set-up,  $f_i$  is increased to obtain a reading of -3 dB at  $V_{os}$ .



**Fig 13. Test circuit for measuring total harmonic distortion**



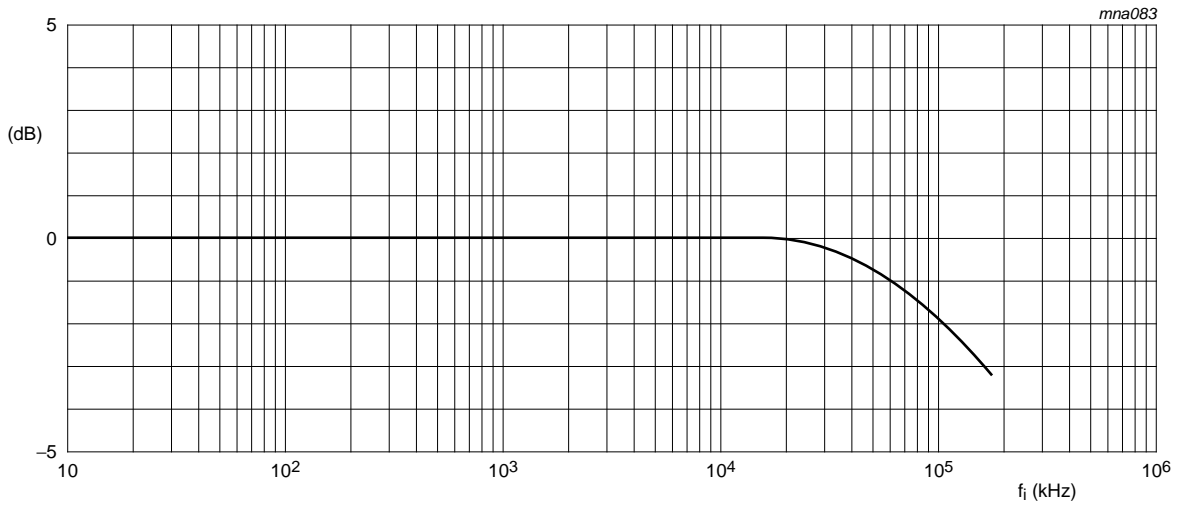
a. Isolation (OFF-state)



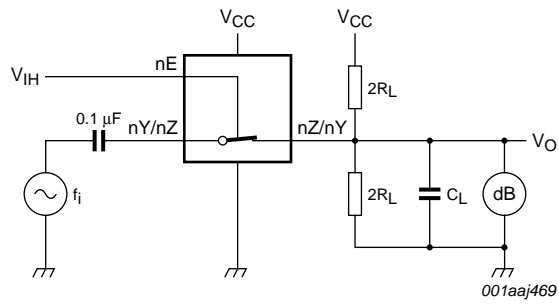
b. Test circuit

$V_{CC} = 4.5\text{ V}$ ;  $GND = 0\text{ V}$ ;  $R_L = 600\ \Omega$ ;  $R_{source} = 1\text{ k}\Omega$ .

**Fig 14. Isolation (OFF-state) as a function of frequency**



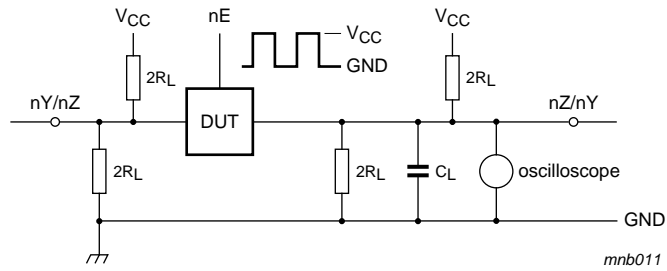
a. Typical -3 dB frequency response



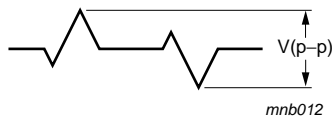
b. Test circuit

$V_{CC} = 4.5\text{ V}$ ;  $GND = 0\text{ V}$ ;  $R_L = 50\ \Omega$ ;  $R_{source} = 1\text{ k}\Omega$ .

**Fig 15. -3 dB frequency response**

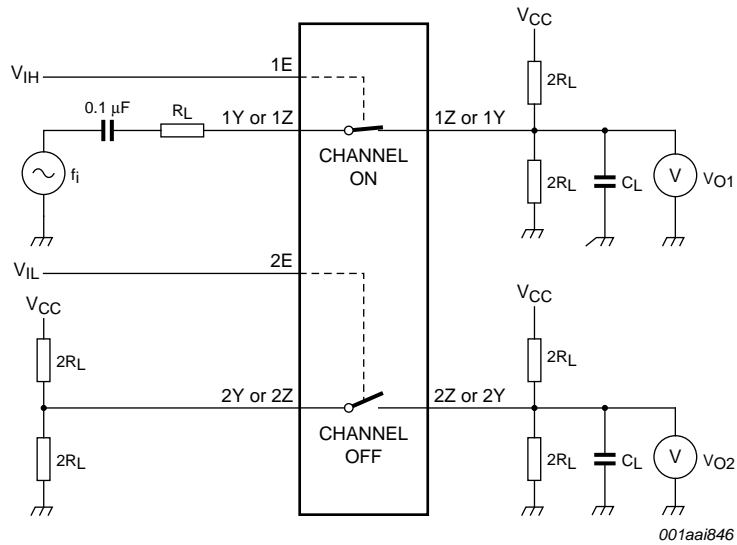


a. Circuit



b. Crosstalk voltage

**Fig 16. Test circuit for measuring crosstalk voltage (between the digital input and the switch)**



**Fig 17. Test circuit for measuring crosstalk (between the switches)**



## 13. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

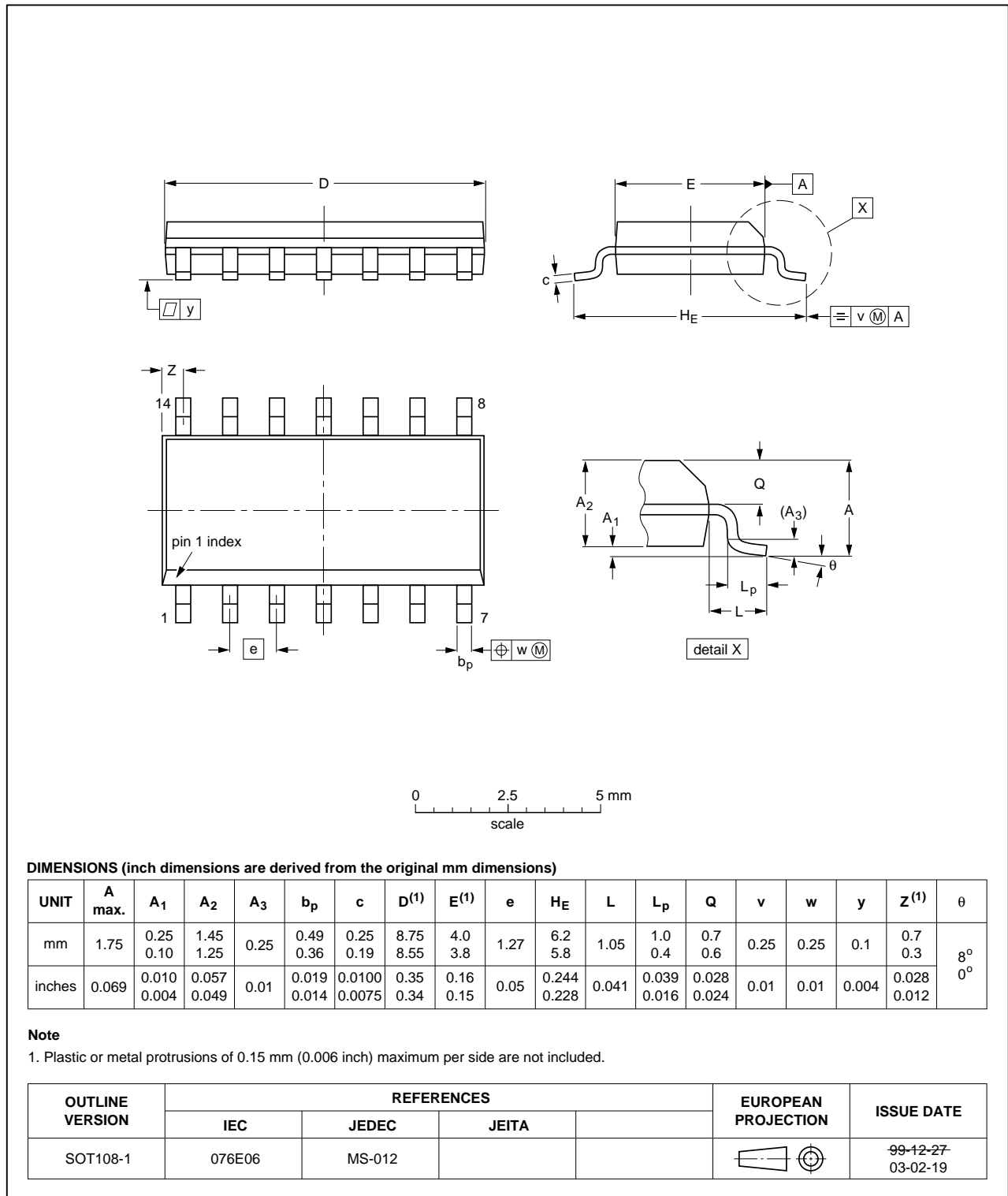


Fig 18. Package outline SOT108-1 (SO14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

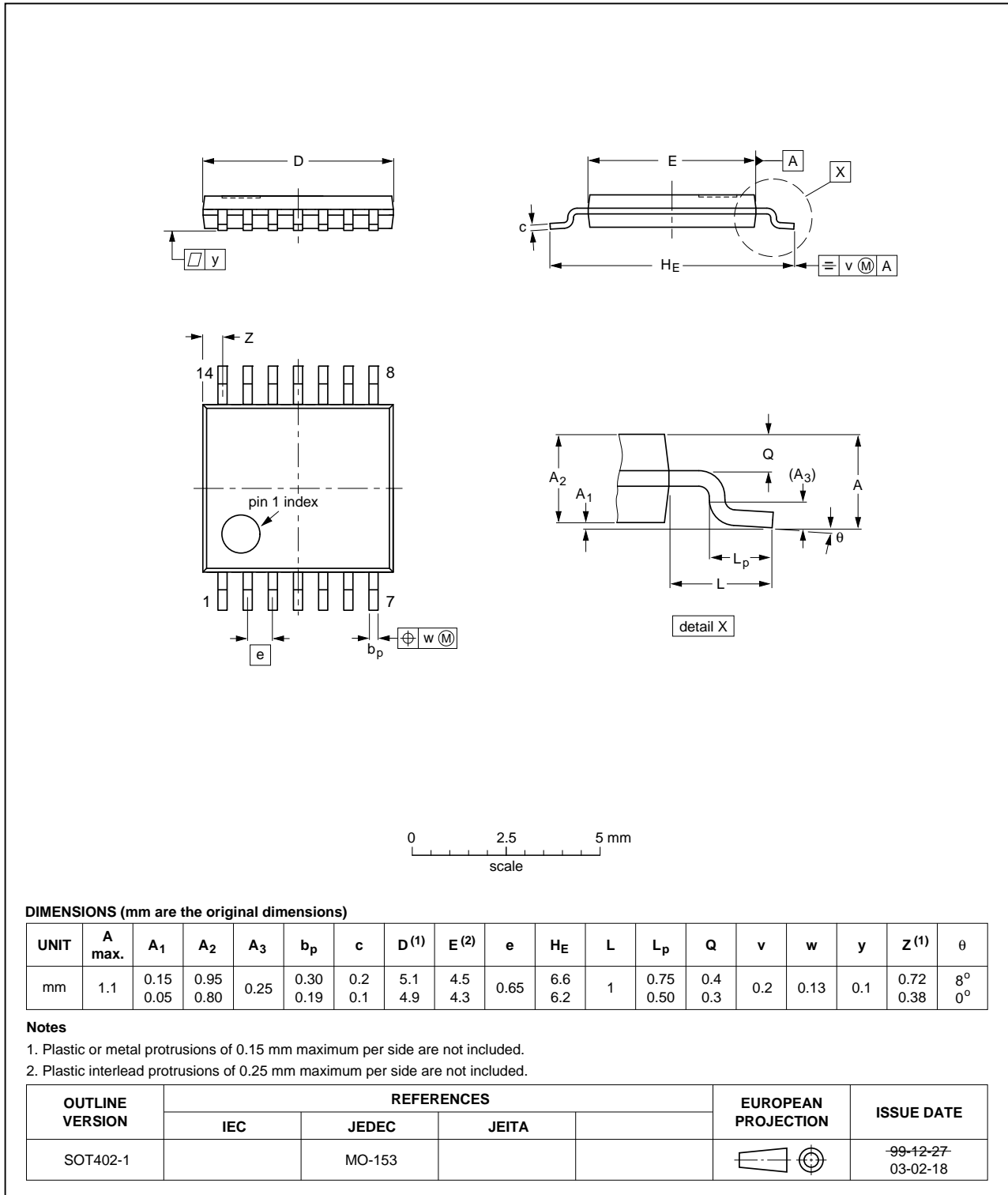
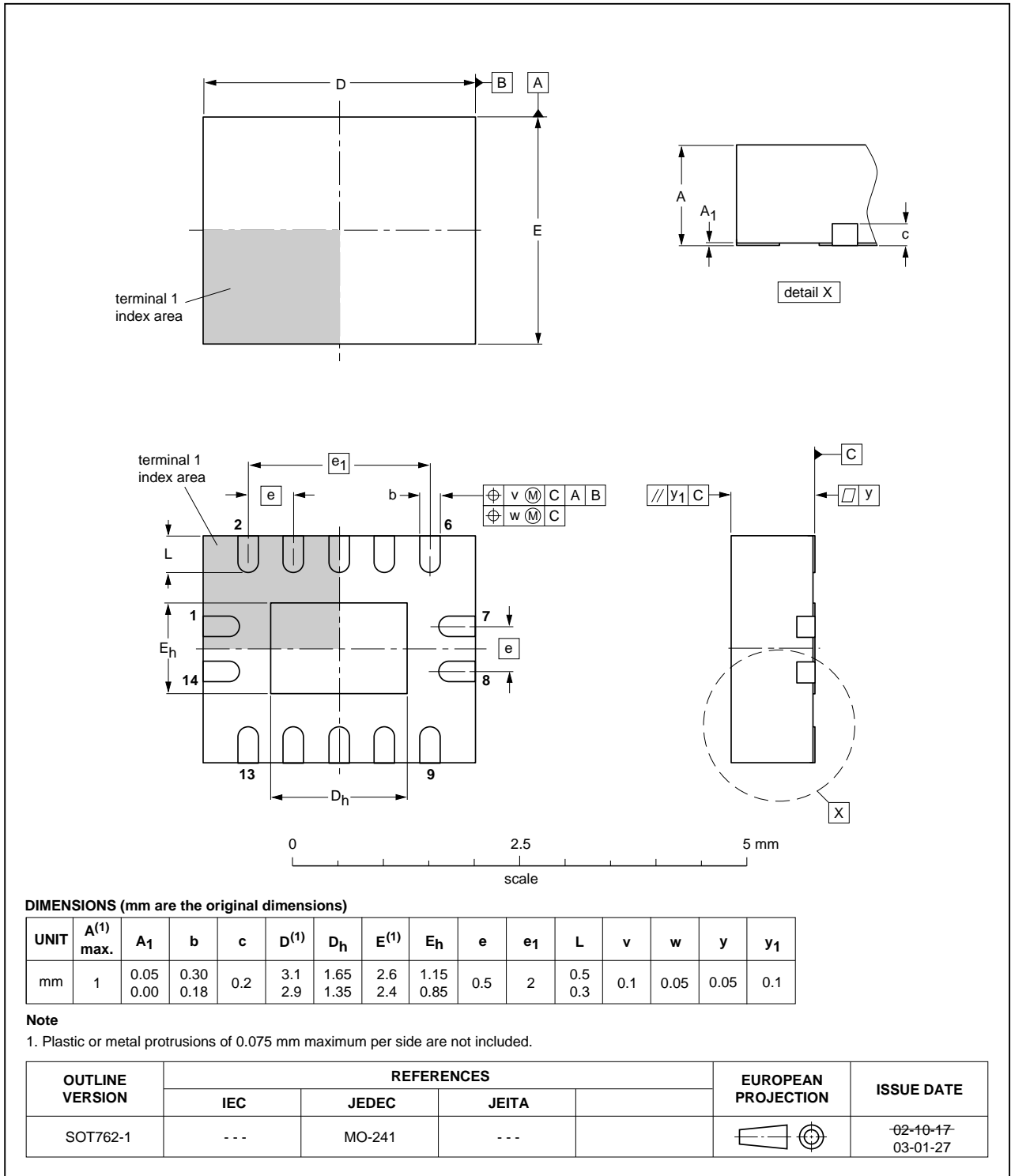


Fig 19. Package outline SOT402-1 (TSSOP14)

**DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm**

**SOT762-1**



**Fig 20. Package outline SOT762-1 (DHVQFN14)**

## 14. Abbreviations

**Table 14. Abbreviations**

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
CDM	Charge-Device Model
MIL	Military

## 15. Revision history

**Table 15. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4066_Q100 v.3	20131216	Product data sheet	-	74HC_HCT4066_Q100 v.2
Modifications:	<ul style="list-style-type: none"> <li>• Features and benefits updated (errata).</li> </ul>			
74HC_HCT4066_Q100 v.2	20130404	Product data sheet	-	74HC_HCT4066_Q100 v.1
Modifications:	<ul style="list-style-type: none"> <li>• Descriptive title corrected (errata).</li> <li>• New general description (errata).</li> </ul>			
74HC_HCT4066_Q100 v.1	20120712	Product data sheet	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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