

# 74HC4066; 74HCT4066

Quad single-pole single-throw analog switch

Rev. 7 — 2 April 2013

Product data sheet

## 1. General description

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The 74HC4066; 74HCT4066 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  $V_{CC}$ .

## 2. Features and benefits

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- Input levels nE inputs:
  - ◆ For 74HC4066: CMOS level
  - ◆ For 74HCT4066: 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:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$



### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC4066N 74HCT4066N	-40 °C to +125 °C	DIP14	plastic dual in-line package; 14 leads (300 mil)	SOT27-1
74HC4066D 74HCT4066D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HC4066DB 74HCT4066DB	-40 °C to +125 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1
74HC4066PW 74HCT4066PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74HC4066BQ 74HCT4066BQ	-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

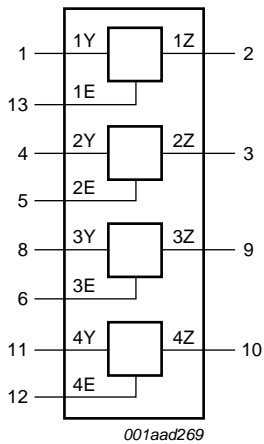


Fig 1. Logic symbol

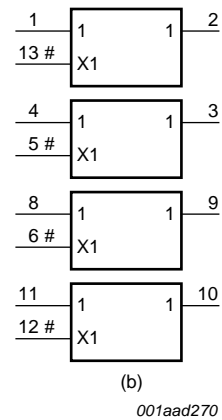
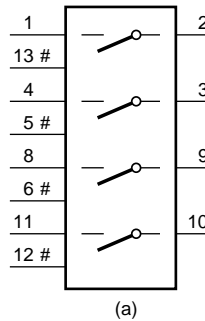


Fig 2. IEC logic symbol

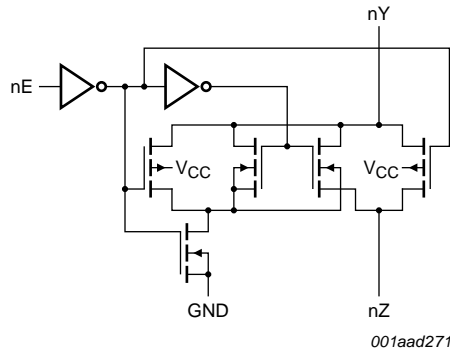


Fig 3. Schematic diagram (one switch)

## 5. Pinning information

### 5.1 Pinning

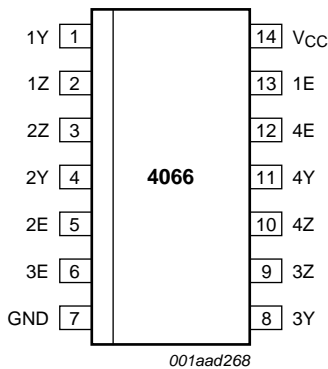
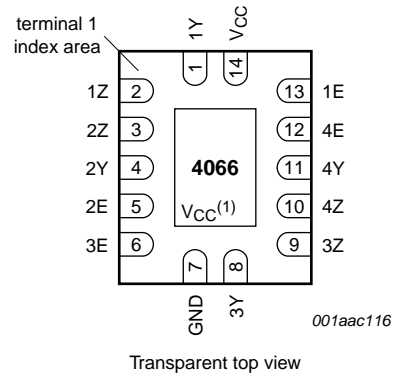


Fig 4. Pin configuration for DIP14, SO14, SSOP14 and TSSOP14



- (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to VCC.

Fig 5. Pin configuration for DHVQFN14

### 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>		
		DIP14 package		-	750
		SO14, (T)SSOP14 and DHVQFN14 packages		-	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 DIP14 package:  $P_{tot}$  derates linearly with 12 mW/K above 70 °C.  
For SO14 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.  
For (T)SSOP14 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			74HCT4066			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.  $R_{ON}$  resistance per switch for types 74HC4066 and 74HCT4066

$V_I = V_{IH}$  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:  $V_{CC} - GND = 2.0\text{ V}, 4.5\text{ V}, 6.0\text{ V}$  and  $9.0\text{ V}$ .

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$R_{ON(peak)}$	ON resistance (peak)	$V_{is} = V_{CC}$ to GND						
		$V_{CC} = 2.0\text{ V}; I_{SW} = 100\ \mu\text{A}$ <a href="#">[2]</a>	-	-	-	-	-	$\Omega$
		$V_{CC} = 4.5\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	54	-	118	142	$\Omega$
		$V_{CC} = 6.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	42	-	105	126	$\Omega$
		$V_{CC} = 9.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	32	-	88	105	$\Omega$
$R_{ON(rail)}$	ON resistance (rail)	$V_{is} = GND$						
		$V_{CC} = 2.0\text{ V}; I_{SW} = 100\ \mu\text{A}$ <a href="#">[2]</a>	-	80	-	-	-	$\Omega$
		$V_{CC} = 4.5\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	35	-	95	115	$\Omega$
		$V_{CC} = 6.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	27	-	82	100	$\Omega$
		$V_{CC} = 9.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	20	-	70	85	$\Omega$
		$V_{is} = V_{CC}$						
		$V_{CC} = 2.0\text{ V}; I_{SW} = 100\ \mu\text{A}$ <a href="#">[2]</a>	-	100	-	-	-	$\Omega$
		$V_{CC} = 4.5\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	42	-	106	128	$\Omega$
		$V_{CC} = 6.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	35	-	94	113	$\Omega$
		$V_{CC} = 9.0\text{ V}; I_{SW} = 1000\ \mu\text{A}$	-	20	-	78	95	$\Omega$

**Table 6.**  $R_{ON}$  resistance per switch for types 74HC4066 and 74HCT4066 ...continued

$V_I = V_{IH}$  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.

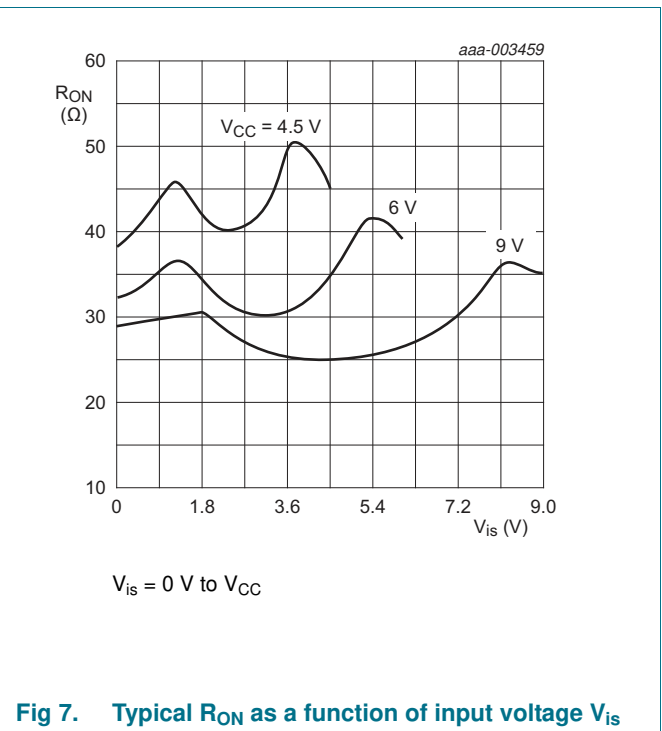
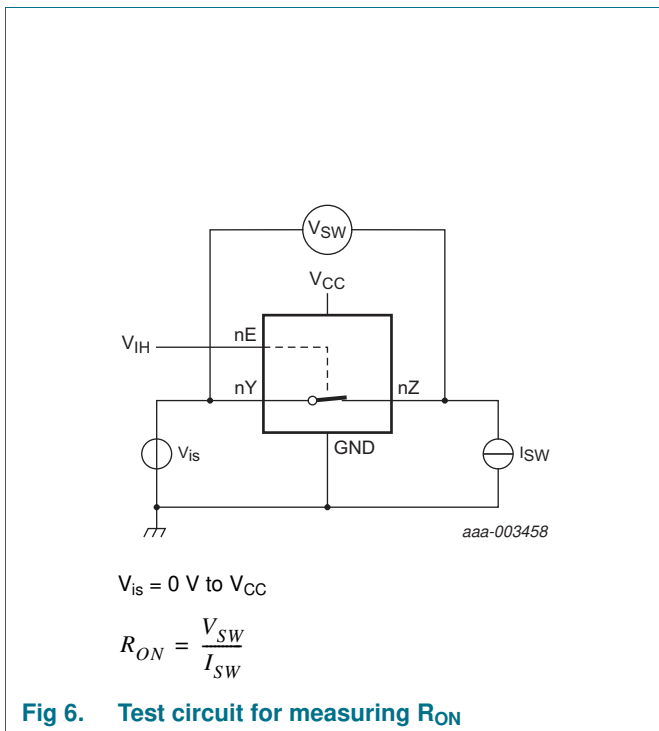
For 74HC4066:  $V_{CC} - GND = 2.0\text{ V}, 4.5\text{ V}, 6.0\text{ V}$  and  $9.0\text{ V}$ .

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$\Delta R_{ON}$	ON resistance mismatch between channels	$V_{is} = V_{CC}$ to GND						
		$V_{CC} = 2.0\text{ V}$	[2]	-	-	-	-	$\Omega$
		$V_{CC} = 4.5\text{ V}$	-	5	-	-	-	$\Omega$
		$V_{CC} = 6.0\text{ V}$	-	4	-	-	-	$\Omega$
		$V_{CC} = 9.0\text{ V}$	-	3	-	-	-	$\Omega$

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

[2] At supply voltages ( $V_{CC} - GND$ ) 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**

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\text{ °C to }+85\text{ °C}</math></b>						
$V_{IH}$	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	$V_I = V_{CC}$ or GND				
		$V_{CC} = 6.0\text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
		$V_{CC} = 10.0\text{ V}$	-	-	$\pm 2.0$	$\mu\text{A}$
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ 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	$V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ 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				
		$V_{CC} = 6.0\text{ V}$	-	-	20.0	$\mu\text{A}$
		$V_{CC} = 10.0\text{ V}$	-	-	40.0	$\mu\text{A}$
$C_I$	input capacitance		-	3.5	-	pF
$C_{SW}$	switch capacitance		-	8	-	pF
<b><math>T_{amb} = -40\text{ °C to }+125\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	-	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	-	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	-	-	V
		$V_{CC} = 9.0\text{ V}$	6.3	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	-	0.50	V
		$V_{CC} = 4.5\text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	-	1.80	V
		$V_{CC} = 9.0\text{ V}$	-	-	2.70	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND				
		$V_{CC} = 6.0\text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
		$V_{CC} = 10.0\text{ V}$	-	-	$\pm 2.0$	$\mu\text{A}$
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ 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	$V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a>	-	-	$\pm 1.0$	$\mu\text{A}$

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

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

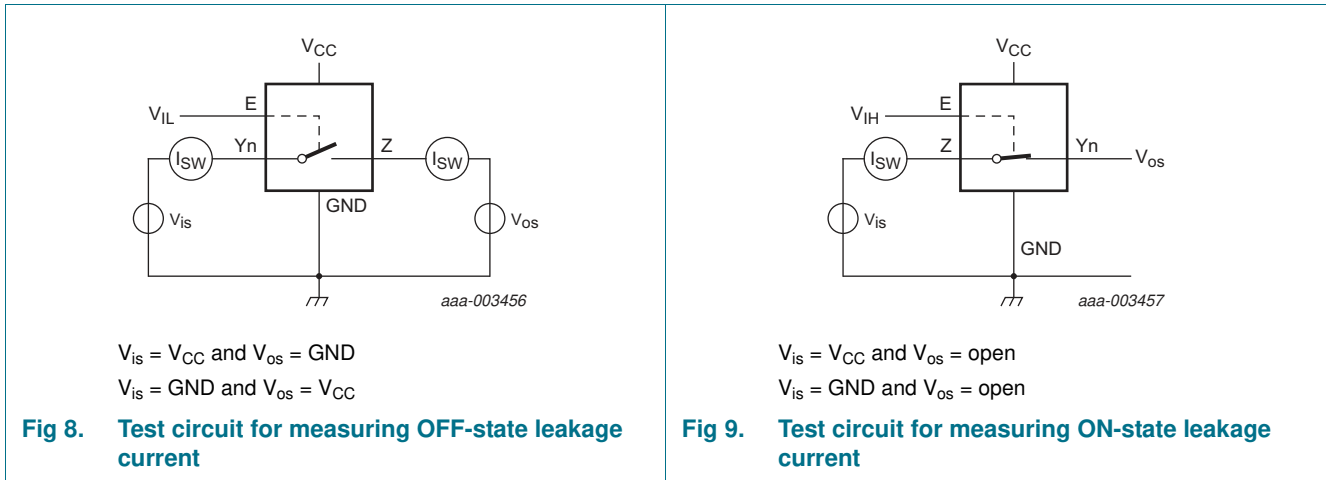
$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

$V_{os}$  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
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5$ 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	$V_{CC} = 5.5$ 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; $V_{CC} = 4.5$ V to $5.5$ V	-	-	20.0	$\mu$ A
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = V_{CC} - 2.1$ V; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5$ V to $5.5$ V	-	100	450	$\mu$ 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	$V_{CC} = 4.5$ V to $5.5$ V	2.0	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5$ V to $5.5$ V	-	-	0.8	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 1.0$	$\mu$ A
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 5.5$ 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	$V_{CC} = 5.5$ 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; $V_{CC} = 4.5$ V to $5.5$ V	-	-	40	$\mu$ A
$\Delta I_{CC}$	additional supply current	per input pin; $V_I = V_{CC} - 2.1$ V; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5$ V to $5.5$ V	-	-	490	$\mu$ A

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





## 10. Dynamic characteristics

**Table 9. Dynamic characteristics 74HC4066**

$GND = 0 V$ ;  $t_r = t_f = 6 ns$ ;  $C_L = 50 pF$  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>						
		$V_{CC} = 2.0 V$	-	8	75	-	90	ns
		$V_{CC} = 4.5 V$	-	3	15	-	18	ns
		$V_{CC} = 6.0 V$	-	2	13	-	15	ns
		$V_{CC} = 9.0 V$	-	2	10	-	12	ns
$t_{off}$	turn-off time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>						
		$V_{CC} = 2.0 V$	-	44	190	-	225	ns
		$V_{CC} = 4.5 V$	-	16	38	-	45	ns
		$V_{CC} = 5.0 V$ ; $C_L = 15 pF$	-	13	-	-	-	ns
		$V_{CC} = 6.0 V$	-	13	33	-	38	ns
$t_{on}$	turn-on time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>						
		$V_{CC} = 2.0 V$	-	36	125	-	150	ns
		$V_{CC} = 4.5 V$	-	13	25	-	30	ns
		$V_{CC} = 5.0 V$ ; $C_L = 15 pF$	-	11	-	-	-	ns
		$V_{CC} = 6.0 V$	-	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  $T_{amb} = 25 °C$ .

[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  $\mu W$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  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**

$GND = 0 V$ ;  $t_r = t_f = 6 ns$ ;  $C_L = 50 pF$  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>						
		$V_{CC} = 4.5 V$	-	3	15	-	18	ns
$t_{off}$	turn-off time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>						
		$V_{CC} = 4.5 V$	-	20	44	-	53	ns
		$V_{CC} = 5.0 V$ ; $C_L = 15 pF$	-	16	-	-	-	ns
$t_{on}$	turn-on time	nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>						
		$V_{CC} = 4.5 V$	-	12	30	-	36	ns
		$V_{CC} = 5.0 V$ ; $C_L = 15 pF$	-	12	-	-	-	ns
$C_{PD}$	power dissipation capacitance	per switch; $V_I = GND$ to $(V_{CC} - 1.5 V)$ <sup>[5]</sup>	-	12	-	-	-	pF

- [1] Typical values are measured at  $T_{amb} = 25 °C$ .
- [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  $\mu W$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  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

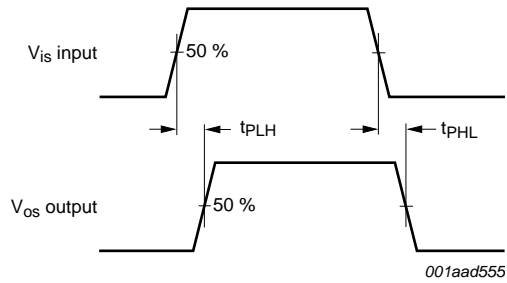
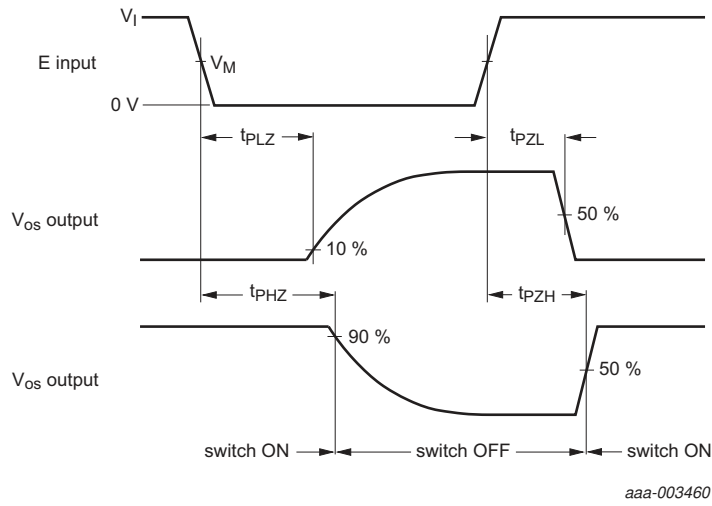


Fig 10. Input ( $V_{is}$ ) to output ( $V_{os}$ ) propagation delays

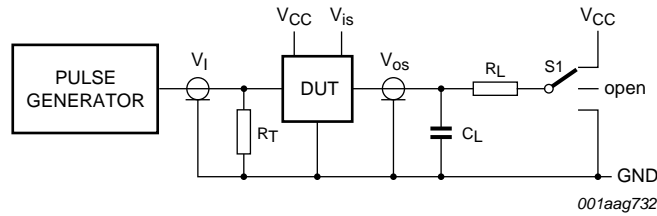
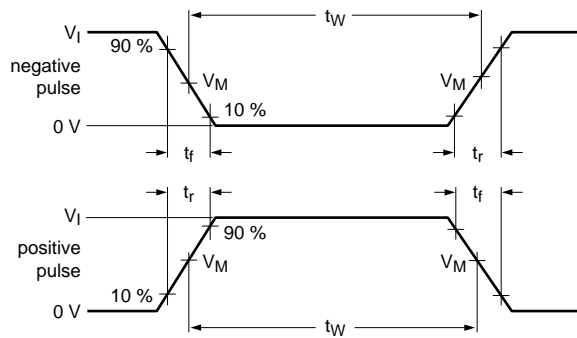


Measurement points are shown in [Table 11](#).

Fig 11. Turn-on and turn-off times

Table 11. Measurement points

Type	$V_I$	$V_M$
74HC4066	$V_{CC}$	$0.5V_{CC}$
74HCT4066	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)		
	$V_I$ [1]	$V_{is}$		$C_L$	$R_L$	
$t_{PHL}, t_{PLH}$	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: 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  $V_{os}$ .

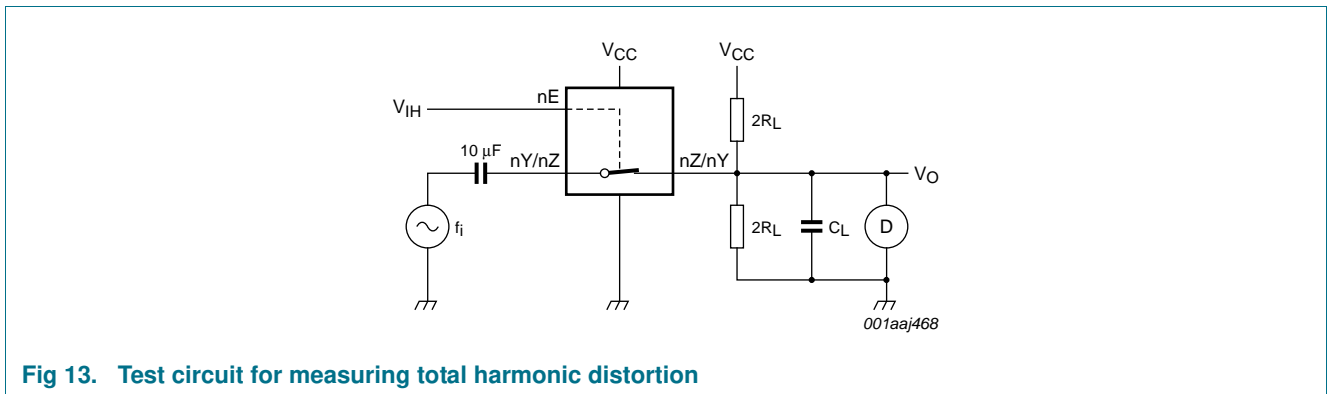
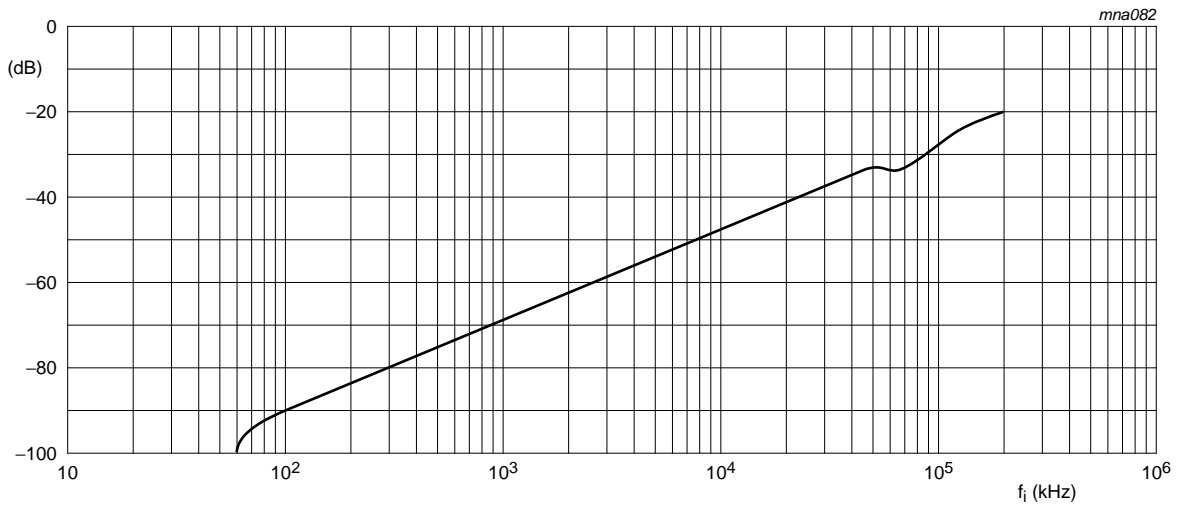
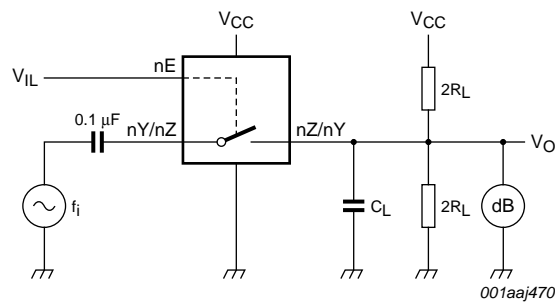


Fig 13. Test circuit for measuring total harmonic distortion



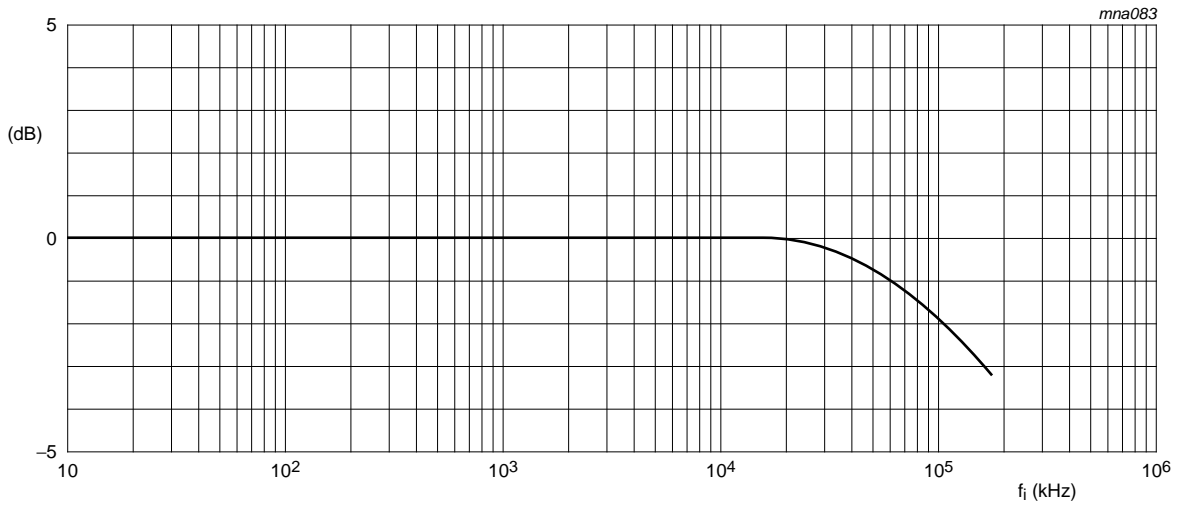
a. Isolation (OFF-state)



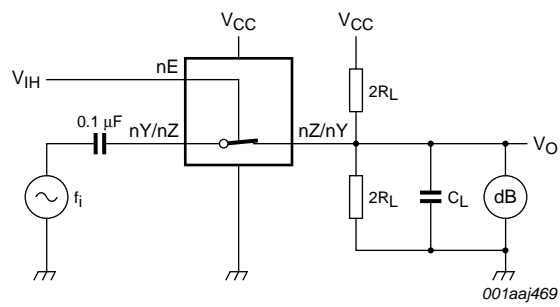
b. Test circuit

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

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



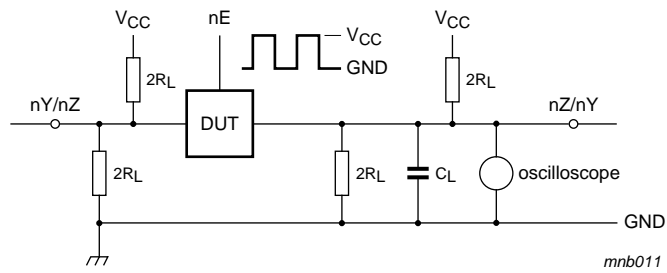
a. Typical -3 dB frequency response



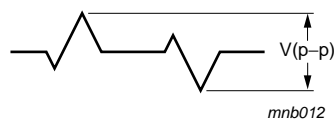
b. Test circuit

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

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

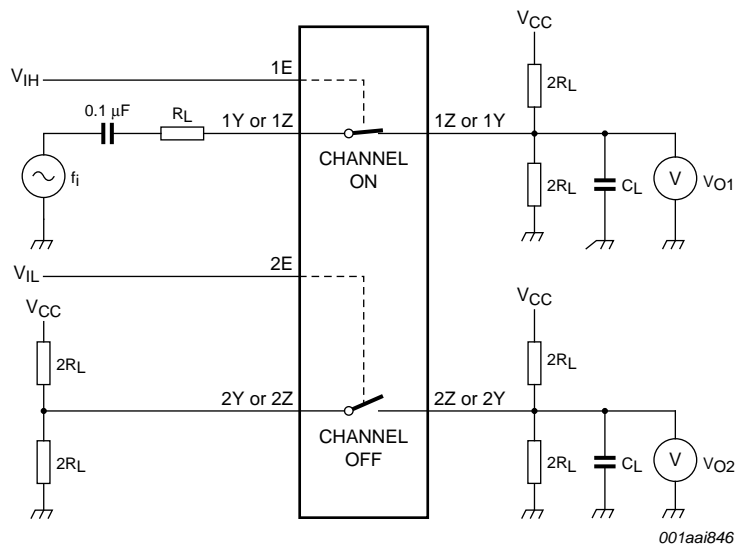


a. Circuit



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

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1

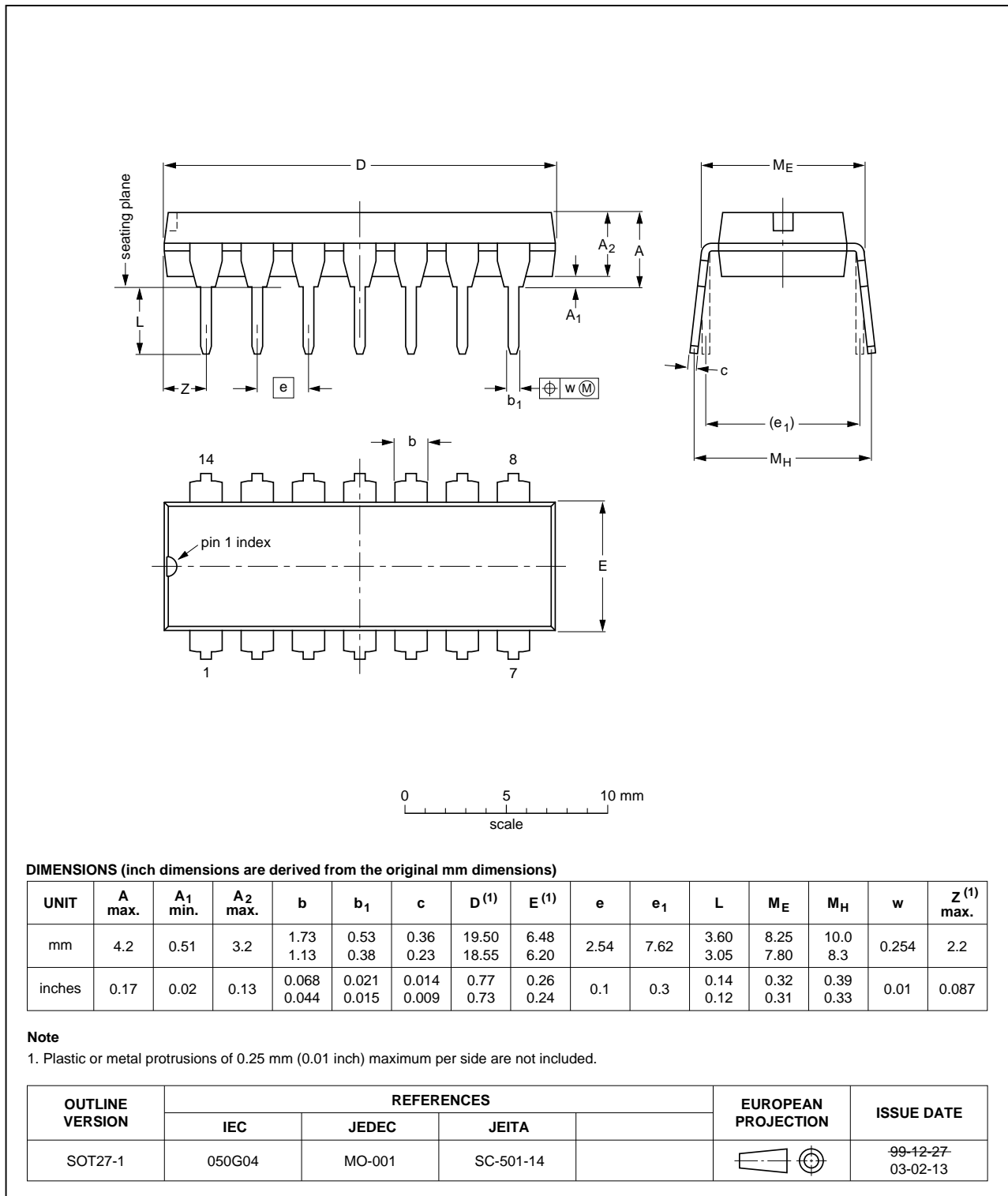


Fig 18. Package outline SOT27-1 (DIP14)

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

SOT108-1

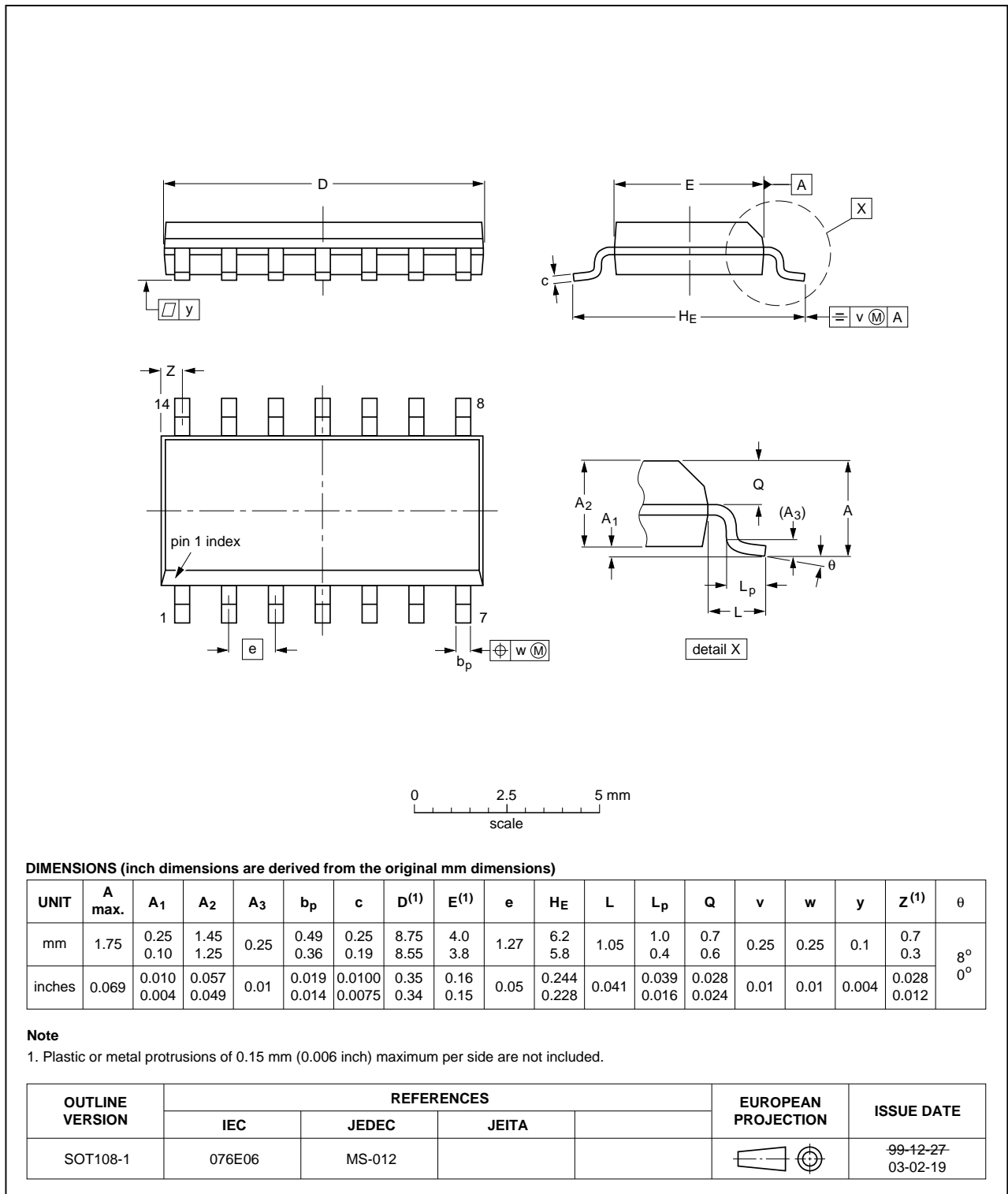


Fig 19. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

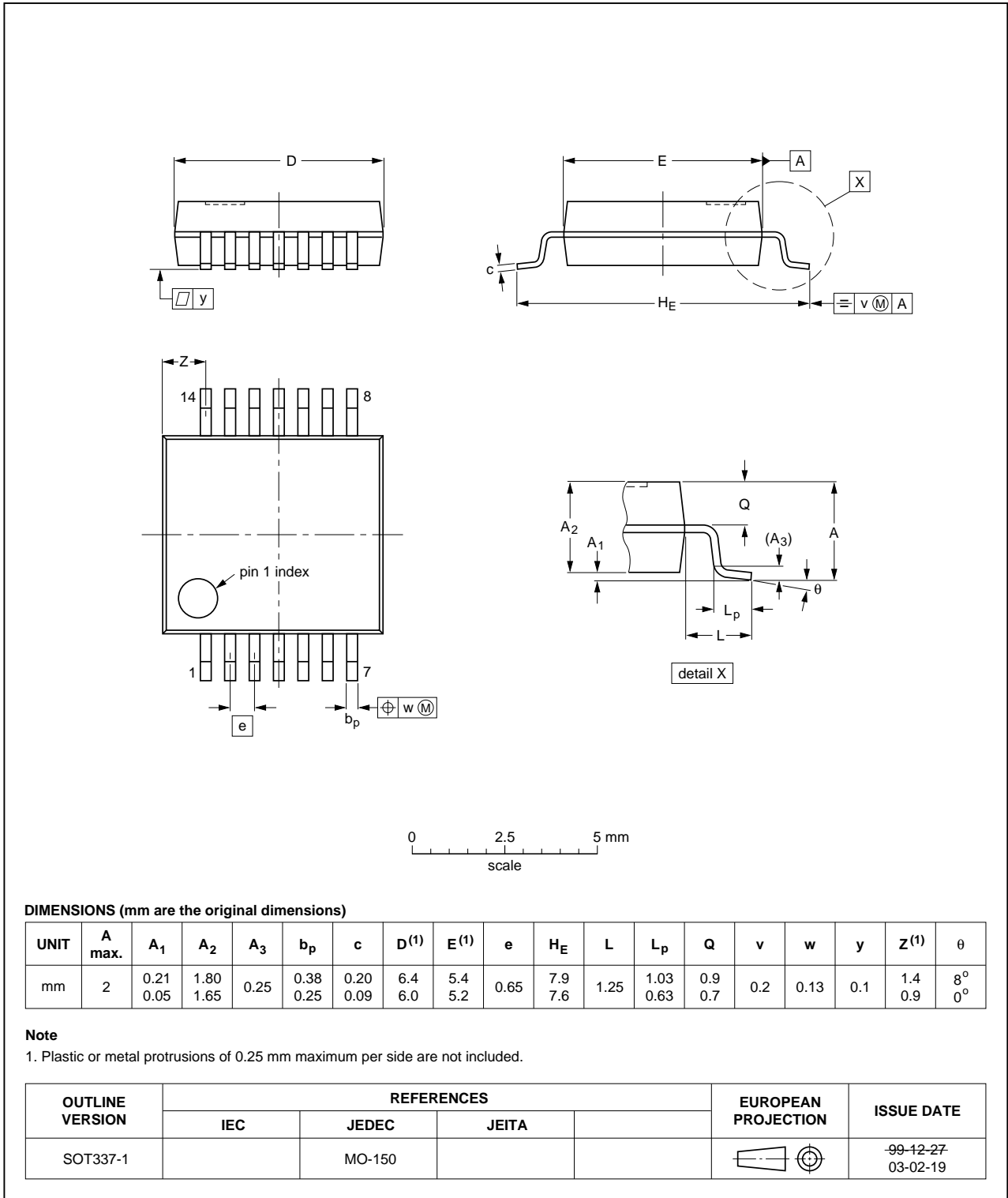


Fig 20. Package outline SOT337-1 (SSOP14)

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

SOT402-1

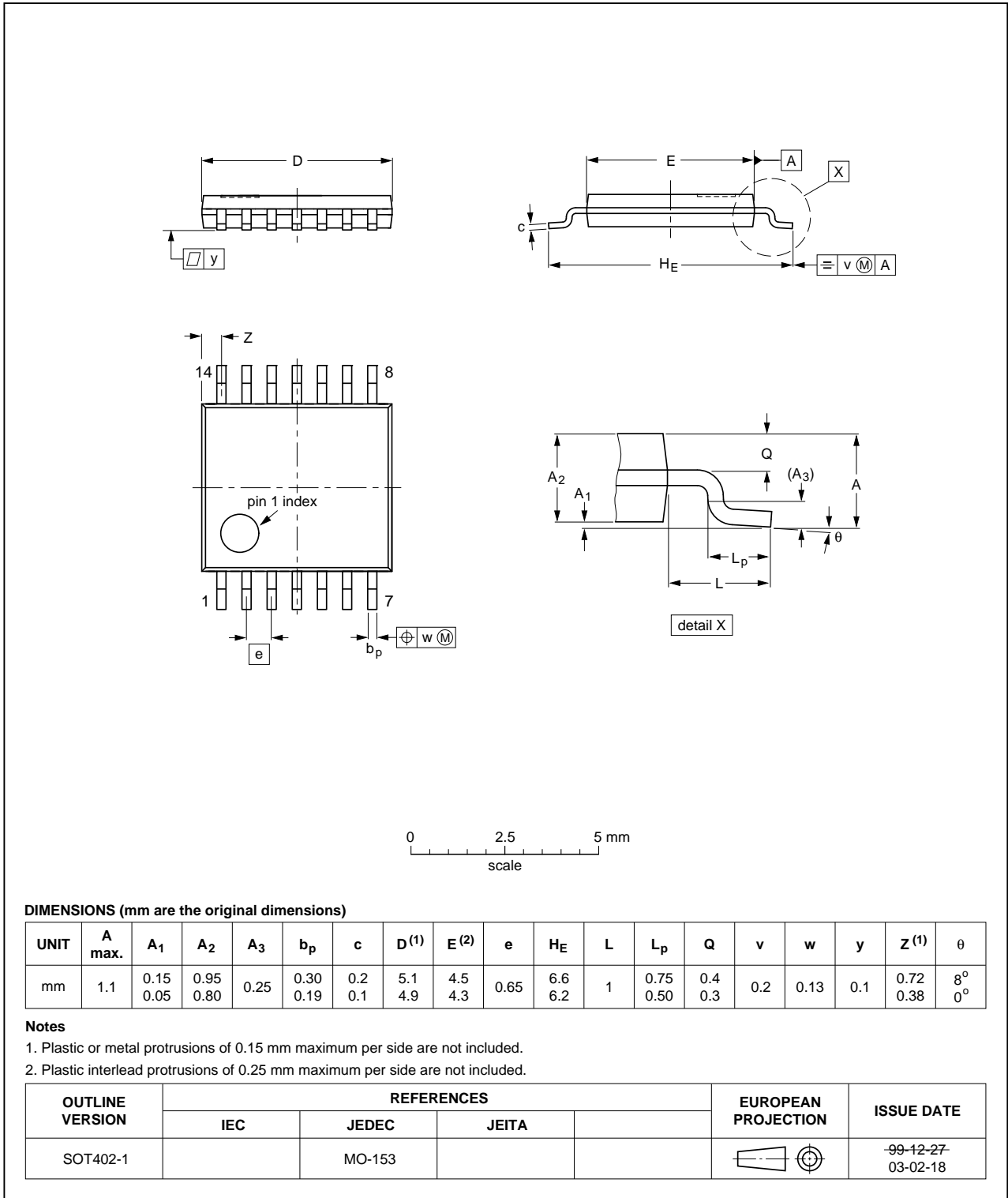


Fig 21. Package outline SOT402-1 (TSSOP14)

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

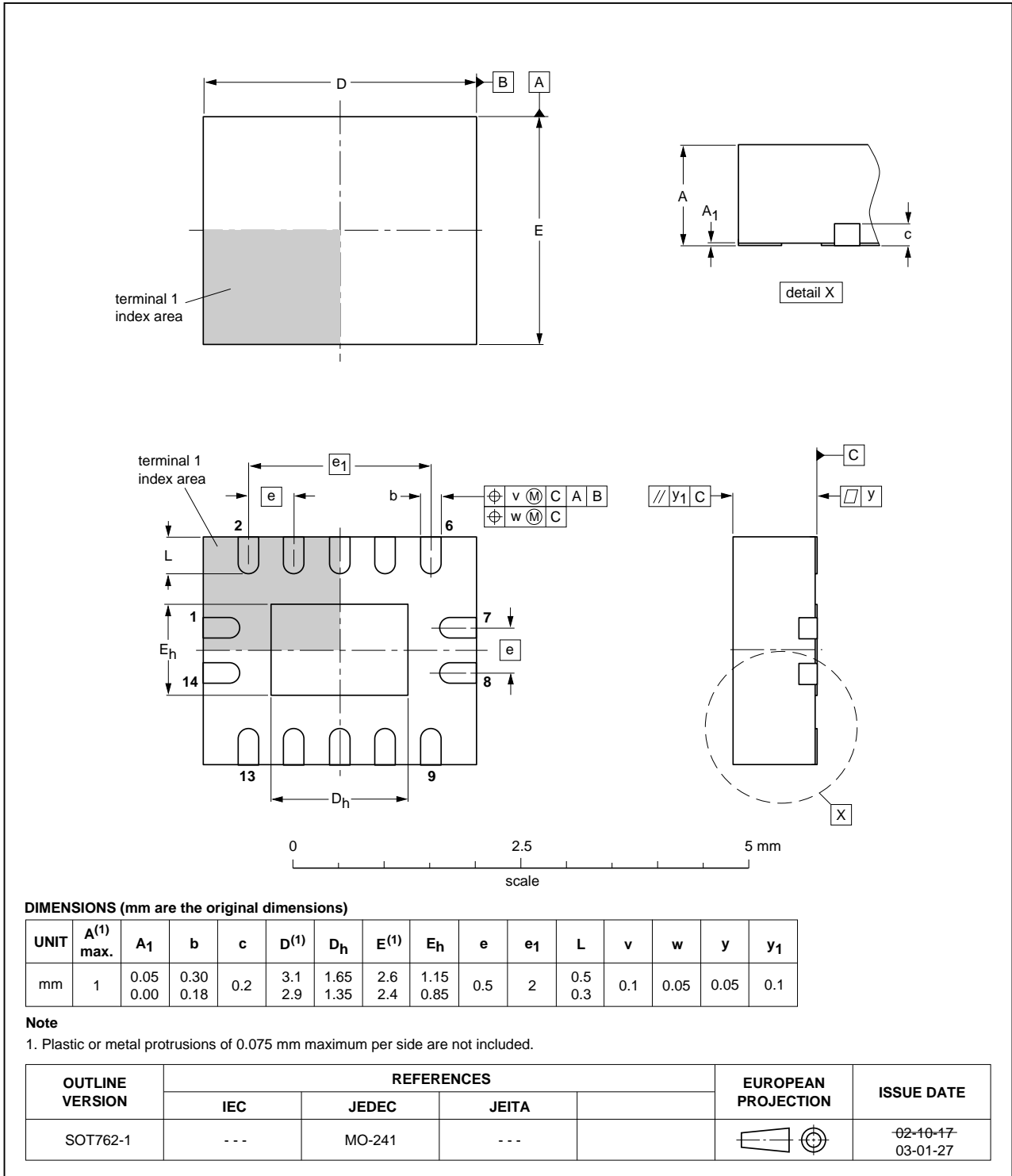


Fig 22. Package outline SOT762-1 (DHVQFN14)

## 14. Abbreviations

Table 14. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 15. Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4066 v.7	20130402	Product data sheet	-	74HC_HCT4066 v.6
Modifications:	<ul style="list-style-type: none"> <li>• Descriptive title corrected (errata).</li> <li>• New general description (errata).</li> </ul>			
74HC_HCT4066 v.6	20120718	Product data sheet	-	74HC_HCT4066 v.5
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
74HC_HCT4066 v.5	20041111	Product data sheet	-	74HC_HCT4066 v.4
74HC_HCT4066 v.4	20030617	Product data sheet	-	74HC_HCT4066_CNV v.3
74HC_HCT4067_CNV v.3	19981110	Product data sheet	-	74HC_HCT4066_CNV v.2
74HC_HCT4066_CNV v.2	19981002	Product specification	-	-

## 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.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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