

74HC4051; 74HCT4051

8-channel analog multiplexer/demultiplexer

Rev. 8 — 5 February 2016

Product data sheet

1. General description

The 74HC4051; 74HCT4051 is a single-pole octal-throw analog switch (SP8T) suitable for use in analog or digital 8:1 multiplexer/demultiplexer applications. The switch features three digital select inputs (S0, S1 and S2), eight independent inputs/outputs (Yn), a common input/output (Z) and a digital enable input (\bar{E}). When \bar{E} is HIGH, the switches are 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

- Wide analog input voltage range from -5 V to $+5\text{ V}$
- Complies with JEDEC standard no. 7A
- Low ON resistance:
 - ◆ $80\ \Omega$ (typical) at $V_{CC} - V_{EE} = 4.5\text{ V}$
 - ◆ $70\ \Omega$ (typical) at $V_{CC} - V_{EE} = 6.0\text{ V}$
 - ◆ $60\ \Omega$ (typical) at $V_{CC} - V_{EE} = 9.0\text{ V}$
- Logic level translation: to enable 5 V logic to communicate with $\pm 5\text{ V}$ analog signals
- Typical 'break before make' built-in
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 1000 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. Applications

- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC4051D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT4051D				
74HC4051DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HCT4051DB				
74HC4051PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT4051PW				
74HC4051BQ	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1
74HCT4051BQ				

5. Functional diagram

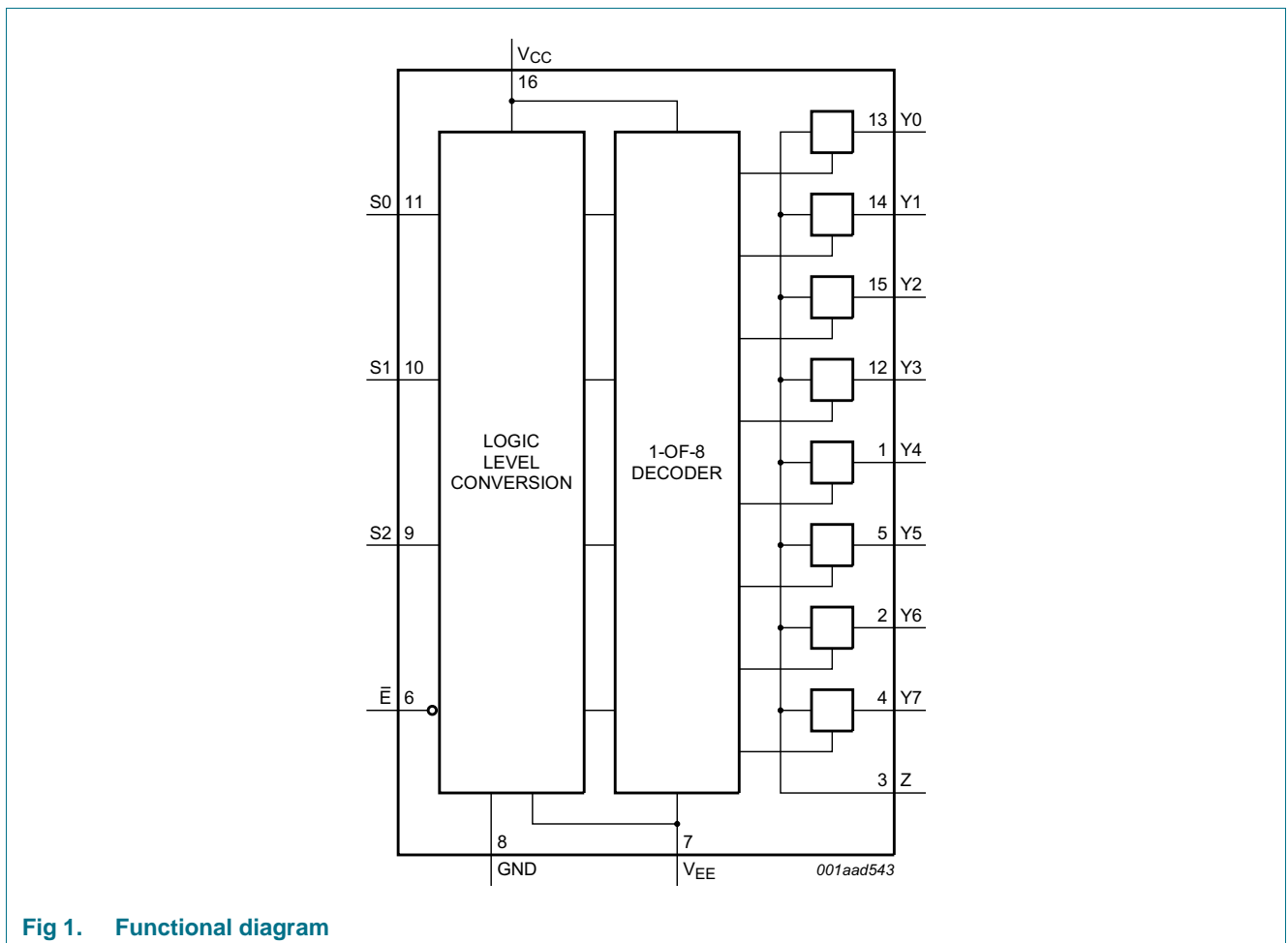
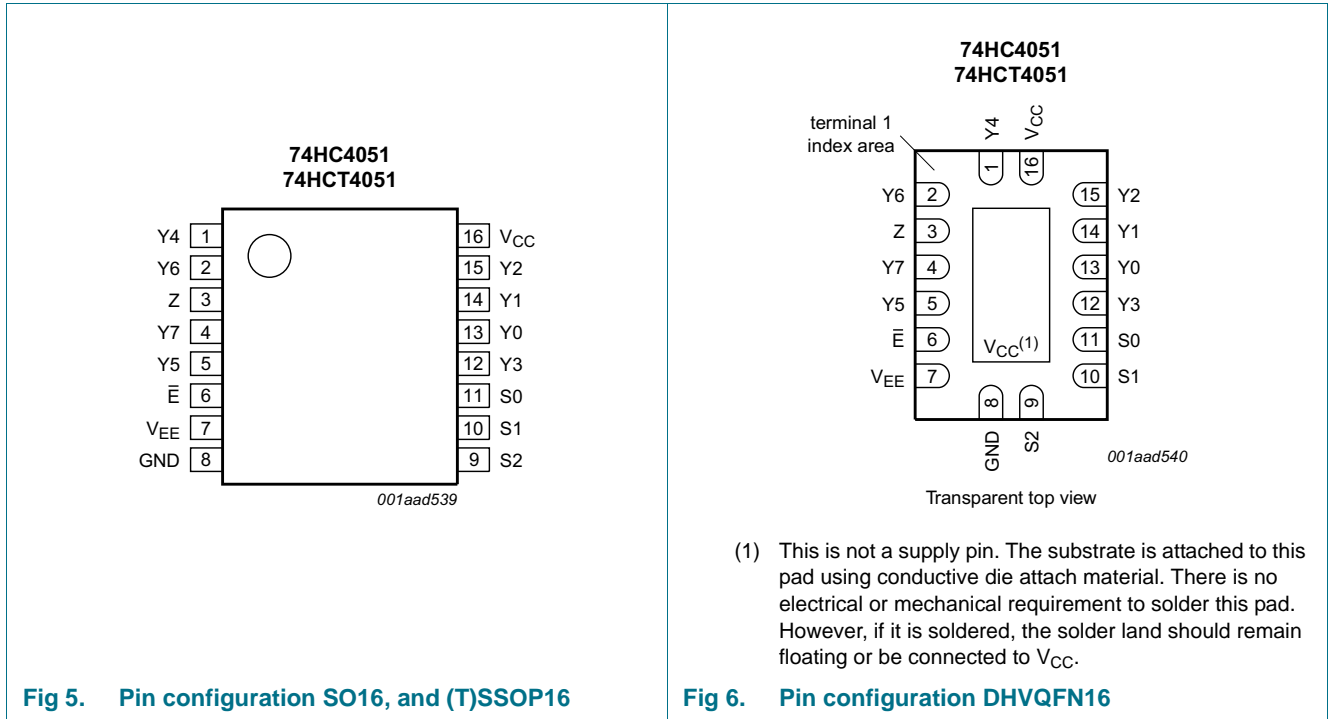


Fig 1. Functional diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
\bar{E}	6	enable input (active LOW)
V _{EE}	7	supply voltage
GND	8	ground supply voltage
S0, S1, S2	11, 10, 9	select input
Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7	13, 14, 15, 12, 1, 5, 2, 4	independent input or output
Z	3	common output or input
V _{CC}	16	supply voltage

7. Functional description

7.1 Function table

Table 3. Function table^[1]

Input				Channel ON
E	S2	S1	S0	
L	L	L	L	Y0 to Z
L	L	L	H	Y1 to Z
L	L	H	L	Y2 to Z
L	L	H	H	Y3 to Z
L	H	L	L	Y4 to Z
L	H	L	H	Y5 to Z
L	H	H	L	Y6 to Z
L	H	H	H	Y7 to Z
H	X	X	X	switches off

- [1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care.

8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to $V_{SS} = 0$ V (ground).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+11.0	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	-	± 20	mA
I_{SK}	switch clamping current	$V_{SW} < -0.5$ V or $V_{SW} > V_{CC} + 0.5$ V	-	± 20	mA
I_{SW}	switch current	-0.5 V $< V_{SW} < V_{CC} + 0.5$ V	-	± 25	mA
I_{EE}	supply current		-	± 20	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	SO16, (T)SSOP16, and DHVQFN16 package	-	500	mW
P	power dissipation	per switch	-	100	mW

- [1] To avoid drawing V_{CC} current out of terminal Z, when switch current flows into terminals Y_n , 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 Y_n , and in this case there is no limit for the voltage drop across the switch, but the voltages at Y_n and Z may not exceed V_{CC} or V_{EE} .
- [2] For SO16 packages: above 70 °C the value of P_{tot} derates linearly with 8 mW/K.
For SSOP16 and TSSOP16 packages: above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.
For DHVQFN16 packages: above 60 °C the value of P_{tot} derates linearly with 4.5 mW/K.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	74HC4051			74HCT4051			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{CC}	supply voltage	see Figure 7 and Figure 8							
		V _{CC} – GND	2.0	5.0	10.0	4.5	5.0	5.5	V
		V _{CC} – V _{EE}	2.0	5.0	10.0	2.0	5.0	10.0	V
V _I	input voltage		GND	-	V _{CC}	GND	-	V _{CC}	V
V _{SW}	switch voltage		V _{EE}	-	V _{CC}	V _{EE}	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 6.0 V	-	-	83	-	-	-	ns/V
		V _{CC} = 10.0 V	-	-	31	-	-	-	ns/V

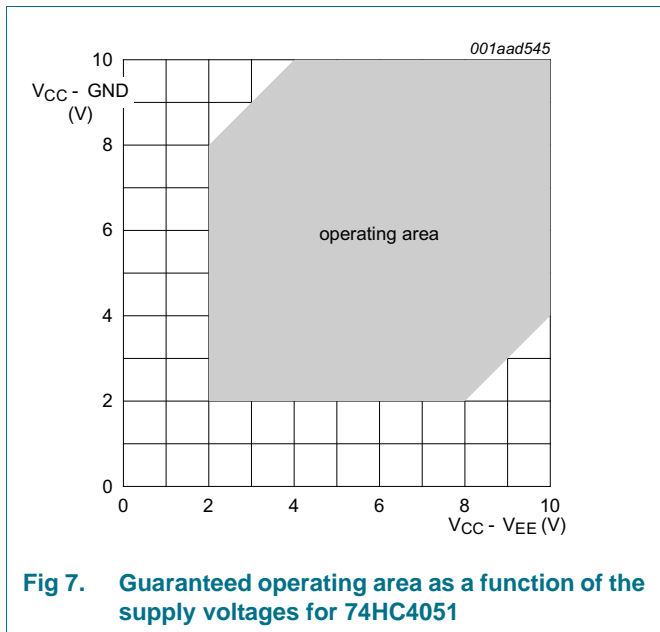


Fig 7. Guaranteed operating area as a function of the supply voltages for 74HC4051

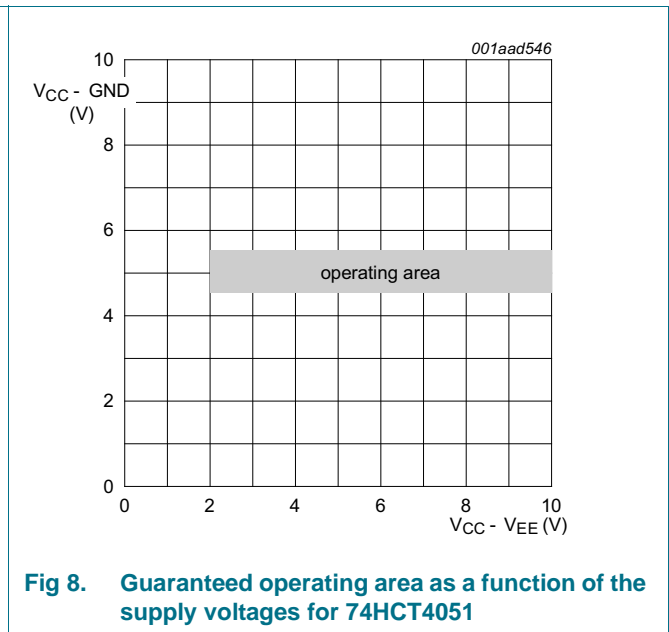


Fig 8. Guaranteed operating area as a function of the supply voltages for 74HCT4051

10. Static characteristics

Table 6. R_{ON} resistance per switch for 74HC4051 and 74HCT4051

$V_I = V_{IH}$ or V_{IL} ; for test circuit see [Figure 9](#).

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 74HC4051: $V_{CC} - GND$ or $V_{CC} - V_{EE} = 2.0\text{ V}$, 4.5 V , 6.0 V and 9.0 V .

For 74HCT4051: $V_{CC} - GND = 4.5\text{ V}$ and 5.5 V , $V_{CC} - V_{EE} = 2.0\text{ V}$, 4.5 V , 6.0 V and 9.0 V .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$T_{amb} = 25\text{ °C}$							
$R_{ON(peak)}$	ON resistance (peak)	$V_{is} = V_{CC}$ to V_{EE}					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	100	180	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	90	160	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	70	130	Ω
$R_{ON(rail)}$	ON resistance (rail)	$V_{is} = V_{EE}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	150	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	80	140	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	70	120	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	60	105	Ω
		$V_{is} = V_{CC}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	150	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	90	160	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	80	140	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	65	120	Ω
ΔR_{ON}	ON resistance mismatch between channels	$V_{is} = V_{CC}$ to V_{EE}					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$		-	9	-	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$		-	8	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$		-	6	-	Ω
$T_{amb} = -40\text{ °C to }+85\text{ °C}$							
$R_{ON(peak)}$	ON resistance (peak)	$V_{is} = V_{CC}$ to V_{EE}					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	225	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	200	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	165	Ω

Table 6. R_{ON} resistance per switch for 74HC4051 and 74HCT4051 ...continued

$V_I = V_{IH}$ or V_{IL} ; for test circuit see [Figure 9](#).

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

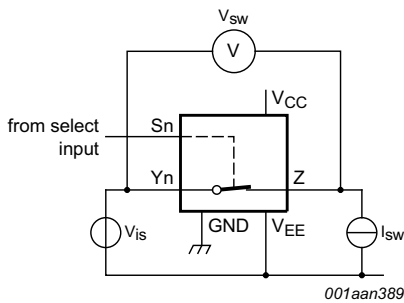
V_{os} is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

For 74HC4051: $V_{CC} - GND$ or $V_{CC} - V_{EE} = 2.0\text{ V}$, 4.5 V , 6.0 V and 9.0 V .

For 74HCT4051: $V_{CC} - GND = 4.5\text{ V}$ and 5.5 V , $V_{CC} - V_{EE} = 2.0\text{ V}$, 4.5 V , 6.0 V and 9.0 V .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{ON(\text{rail})}$	ON resistance (rail)	$V_{is} = V_{EE}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	175	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	150	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	130	Ω
		$V_{is} = V_{CC}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	200	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	175	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	150	Ω
$T_{amb} = -40\text{ }^\circ\text{C}$ to $+125\text{ }^\circ\text{C}$							
$R_{ON(\text{peak})}$	ON resistance (peak)	$V_{is} = V_{CC}$ to V_{EE}					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	270	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	240	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	195	Ω
$R_{ON(\text{rail})}$	ON resistance (rail)	$V_{is} = V_{EE}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	210	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	180	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	160	Ω
		$V_{is} = V_{CC}$					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 100\text{ }\mu\text{A}$	[1]	-	-	-	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	240	Ω
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	210	Ω
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$; $I_{SW} = 1000\text{ }\mu\text{A}$		-	-	180	Ω

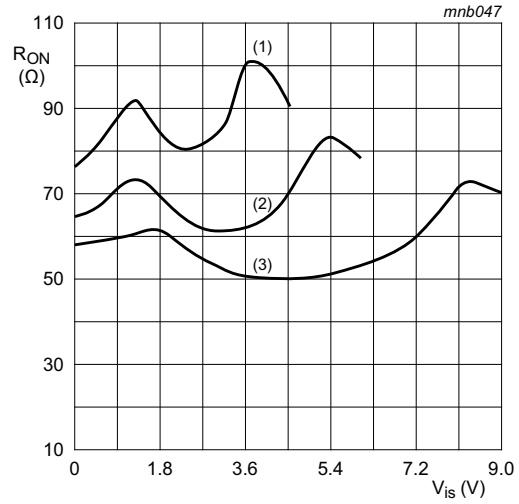
[1] When supply voltages ($V_{CC} - V_{EE}$) near 2.0 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 2 V, it is recommended to use these devices only for transmitting digital signals.



$V_{is} = 0 \text{ V to } (V_{CC} - V_{EE}).$

$$R_{ON} = \frac{V_{sw}}{I_{sw}}$$

Fig 9. Test circuit for measuring R_{ON}



$V_{is} = 0 \text{ V to } (V_{CC} - V_{EE}).$

- (1) $V_{CC} = 4.5 \text{ V}$
- (2) $V_{CC} = 6 \text{ V}$
- (3) $V_{CC} = 9 \text{ V}$

Fig 10. Typical R_{ON} as a function of input voltage V_{is}

Table 7. Static characteristics for 74HC4051

Voltages are referenced to GND (ground = 0 V).

V_{is} is the input voltage at pins Y_n or Z , whichever is assigned as an input.

V_{os} is the output voltage at pins Z or Y_n , whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25 \text{ }^\circ\text{C}$						
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	1.8	V
		$V_{CC} = 9.0 \text{ V}$	-	4.3	2.7	V
I_I	input leakage current	$V_{EE} = 0 \text{ V}; V_I = V_{CC} \text{ or GND}$				
		$V_{CC} = 6.0 \text{ V}$	-	-	± 0.1	μA
		$V_{CC} = 10.0 \text{ V}$	-	-	± 0.2	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0 \text{ V}; V_{EE} = 0 \text{ V}; V_I = V_{IH} \text{ or } V_{IL}; V_{SW} = V_{CC} - V_{EE};$ see Figure 11				
		per channel	-	-	± 0.1	μA
		all channels	-	-	± 0.4	μA
$I_{S(ON)}$	ON-state leakage current	$V_I = V_{IH} \text{ or } V_{IL}; V_{SW} = V_{CC} - V_{EE}; V_{CC} = 10.0 \text{ V}; V_{EE} = 0 \text{ V};$ see Figure 12	-	-	± 0.4	μA

Table 7. Static characteristics for 74HC4051 ...continued

Voltages are referenced to GND (ground = 0 V).

V_{IS} is the input voltage at pins Y_n or Z , whichever is assigned as an input.

V_{OS} is the output voltage at pins Z or Y_n , whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current	$V_{EE} = 0\text{ V}$; $V_I = V_{CC}$ or GND; $V_{IS} = V_{EE}$ or V_{CC} ; $V_{OS} = V_{CC}$ or V_{EE}				
		$V_{CC} = 6.0\text{ V}$	-	-	8.0	μA
		$V_{CC} = 10.0\text{ V}$	-	-	16.0	μA
C_I	input capacitance		-	3.5	-	pF
C_{SW}	switch capacitance	independent pins Y_n	-	5	-	pF
		common pins Z	-	25	-	pF
$T_{amb} = -40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$						
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	$V_{CC} = 2.0\text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	-	1.8	V
		$V_{CC} = 9.0\text{ V}$	-	-	2.7	V
I_I	input leakage current	$V_{EE} = 0\text{ V}$; $V_I = V_{CC}$ or GND				
		$V_{CC} = 6.0\text{ V}$	-	-	± 1.0	μA
		$V_{CC} = 10.0\text{ V}$	-	-	± 2.0	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 11				
		per channel	-	-	± 1.0	μA
		all channels	-	-	± 4.0	μA
$I_{S(ON)}$	ON-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; $V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; see Figure 12	-	-	± 4.0	μA
I_{CC}	supply current	$V_{EE} = 0\text{ V}$; $V_I = V_{CC}$ or GND; $V_{IS} = V_{EE}$ or V_{CC} ; $V_{OS} = V_{CC}$ or V_{EE}				
		$V_{CC} = 6.0\text{ V}$	-	-	80.0	μA
		$V_{CC} = 10.0\text{ V}$	-	-	160.0	μA
$T_{amb} = -40\text{ }^\circ\text{C}$ to $+125\text{ }^\circ\text{C}$						
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	$V_{CC} = 2.0\text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	-	1.8	V
		$V_{CC} = 9.0\text{ V}$	-	-	2.7	V

Table 7. Static characteristics for 74HC4051 ...continued

Voltages are referenced to GND (ground = 0 V).

V_{is} is the input voltage at pins Y_n or Z , whichever is assigned as an input.

V_{os} is the output voltage at pins Z or Y_n , whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_I	input leakage current	$V_{EE} = 0\text{ V}$; $V_I = V_{CC}$ or GND				
		$V_{CC} = 6.0\text{ V}$	-	-	± 1.0	μA
		$V_{CC} = 10.0\text{ V}$	-	-	± 2.0	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 11				
		per channel	-	-	± 1.0	μA
		all channels	-	-	± 4.0	μA
$I_{S(ON)}$	ON-state leakage current	$V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; $V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; see Figure 12	-	-	± 4.0	μA
I_{CC}	supply current	$V_{EE} = 0\text{ V}$; $V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or V_{CC} ; $V_{os} = V_{CC}$ or V_{EE}				
		$V_{CC} = 6.0\text{ V}$	-	-	160.0	μA
		$V_{CC} = 10.0\text{ V}$	-	-	320.0	μA

Table 8. Static characteristics for 74HCT4051

Voltages are referenced to GND (ground = 0 V).

V_{is} is the input voltage at pins Y_n or Z , whichever is assigned as an input.

V_{os} is the output voltage at pins Z or Y_n , whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ }^\circ\text{C}$						
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5\text{ V}$ to 5.5 V	2.0	1.6	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5\text{ V}$ to 5.5 V	-	1.2	0.8	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	± 0.1	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 11				
		per channel	-	-	± 0.1	μA
		all channels	-	-	± 0.4	μA
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 12	-	-	± 0.4	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or V_{CC} ; $V_{os} = V_{CC}$ or V_{EE}				
		$V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	8.0	μA
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = -5.0\text{ V}$	-	-	16.0	μA
ΔI_{CC}	additional supply current	per input; $V_I = V_{CC} - 2.1\text{ V}$; other inputs at V_{CC} or GND; $V_{CC} = 4.5\text{ V}$ to 5.5 V ; $V_{EE} = 0\text{ V}$	-	50	180	μA
C_I	input capacitance		-	3.5	-	pF
C_{SW}	switch capacitance	independent pins Y_n	-	5	-	pF
		common pins Z	-	25	-	pF

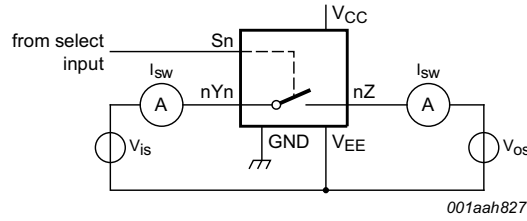
Table 8. Static characteristics for 74HCT4051 ...continued

Voltages are referenced to GND (ground = 0 V).

V_{is} is the input voltage at pins Y_n or Z , whichever is assigned as an input.

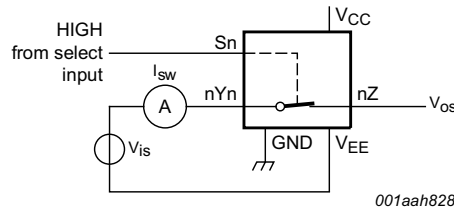
V_{os} is the output voltage at pins Z or Y_n , whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40\text{ °C to }+85\text{ °C}$						
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; $V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	± 1.0	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 11				
		per channel	-	-	± 1.0	μA
		all channels	-	-	± 4.0	μA
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 12	-	-	± 4.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or V_{CC} ; $V_{os} = V_{CC}$ or V_{EE}				
		$V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	80.0	μA
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = -5.0\text{ V}$	-	-	160.0	μA
ΔI_{CC}	additional supply current	per input; $V_I = V_{CC} - 2.1\text{ V}$; other inputs at V_{CC} or GND; $V_{CC} = 4.5\text{ V to }5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	225	μA
$T_{amb} = -40\text{ °C to }+125\text{ °C}$						
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; $V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	± 1.0	μA
$I_{S(OFF)}$	OFF-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 11				
		per channel	-	-	± 1.0	μA
		all channels	-	-	± 4.0	μA
$I_{S(ON)}$	ON-state leakage current	$V_{CC} = 10.0\text{ V}$; $V_{EE} = 0\text{ V}$; $V_I = V_{IH}$ or V_{IL} ; $ V_{SW} = V_{CC} - V_{EE}$; see Figure 12	-	-	± 4.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or V_{CC} ; $V_{os} = V_{CC}$ or V_{EE}				
		$V_{CC} = 5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	160.0	μA
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = -5.0\text{ V}$	-	-	320.0	μA
ΔI_{CC}	additional supply current	per input; $V_I = V_{CC} - 2.1\text{ V}$; other inputs at V_{CC} or GND; $V_{CC} = 4.5\text{ V to }5.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	245	μA



$V_{is} = V_{CC}$ and $V_{os} = V_{EE}$.
 $V_{is} = V_{EE}$ and $V_{os} = V_{CC}$.

Fig 11. Test circuit for measuring OFF-state current



$V_{is} = V_{CC}$ and $V_{os} = \text{open-circuit}$.
 $V_{is} = V_{EE}$ and $V_{os} = \text{open-circuit}$.

Fig 12. Test circuit for measuring ON-state current

11. Dynamic characteristics

Table 9. Dynamic characteristics for 74HC4051

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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
$T_{amb} = 25\text{ °C}$						
t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13	[1]			
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	14	60	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	5	12	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	4	10	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	4	8	ns

Table 9. Dynamic characteristics for 74HC4051 ...continued

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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	
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	72	345	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	29	69	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	22	-	ns	
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	21	59	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	18	51	ns	
		Sn to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	66	345	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	28	69	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	20	-	ns	
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	19	59	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	16	51	ns	
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	58	290	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	31	58	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	18	-	ns	
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	17	49	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	18	42	ns	
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	61	290	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	25	58	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	19	-	ns	
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	18	49	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	18	42	ns	
C_{PD}	power dissipation capacitance	per switch; $V_I = GND$ to V_{CC} [4]	-	25	-	pF	
$T_{amb} = -40\text{ }^\circ\text{C}$ to $+85\text{ }^\circ\text{C}$							
t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13 [1]					
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	75	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	15	ns	
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	13	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	10	ns	

Table 9. Dynamic characteristics for 74HC4051 ...continued

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	430	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	86	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	73	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	64	ns
		Sn to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	430	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	86	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	73	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	64	ns
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	365	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	73	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	62	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	53	ns
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	365	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	73	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	62	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	53	ns
$T_{amb} = -40\text{ }^\circ\text{C to }+125\text{ }^\circ\text{C}$						
t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13 [1]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	90	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	18	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	15	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	12	ns
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	520	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	104	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	88	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	77	ns
		Sn to V_{os} ; $R_L = \infty\ \Omega$; see Figure 14 [2]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	520	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	104	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	88	ns
$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	77	ns		

Table 9. Dynamic characteristics for 74HC4051 ...continued

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	435	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	87	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	74	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	72	ns
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 2.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	435	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	87	ns
		$V_{CC} = 6.0\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	74	ns
$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	72	ns		

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

[2] t_{on} is the same as t_{PZH} and t_{PZL} .

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

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

N = number of inputs switching;

$\Sigma\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$ = 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 for 74HCT4051

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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
$T_{amb} = 25\text{ }^\circ\text{C}$						
t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13 [1]				
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	5	12	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	4	8	ns
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]				
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	26	55	ns
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	22	-	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	16	39	ns
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]				
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	28	55	ns
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	24	-	ns
$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	16	39	ns		

Table 10. Dynamic characteristics for 74HCT4051 ...continued

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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	
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	19	45	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	16	-	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	16	32	ns	
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	23	45	ns	
		$V_{CC} = 5.0\text{ V}$; $V_{EE} = 0\text{ V}$; $C_L = 15\text{ pF}$	-	20	-	ns	
C_{PD}	power dissipation capacitance	per switch; $V_I = GND$ to $V_{CC} - 1.5\text{ V}$ [4]	-	25	-	pF	
		$T_{amb} = -40\text{ }^\circ\text{C to }+85\text{ }^\circ\text{C}$					
		t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13 [1]			
$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-			-	15	ns	
$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-			-	10	ns	
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	69	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	49	ns	
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	69	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	49	ns	
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	56	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	40	ns	
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	56	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	40	ns	
$T_{amb} = -40\text{ }^\circ\text{C to }+125\text{ }^\circ\text{C}$							
t_{pd}	propagation delay	V_{is} to V_{os} ; $R_L = \infty\ \Omega$; see Figure 13 [1]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	18	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	12	ns	
t_{on}	turn-on time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	83	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	59	ns	
		Sn to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [2]					
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	83	ns	
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	59	ns	

Table 10. Dynamic characteristics for 74HCT4051 ...continued

$GND = 0\text{ V}$; $t_r = t_f = 6\text{ ns}$; $C_L = 50\text{ pF}$; for test circuit see [Figure 15](#).

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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{off}	turn-off time	\bar{E} to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	68	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	48	ns
		S_n to V_{os} ; $R_L = 1\text{ k}\Omega$; see Figure 14 [3]				
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = 0\text{ V}$	-	-	68	ns
		$V_{CC} = 4.5\text{ V}$; $V_{EE} = -4.5\text{ V}$	-	-	48	ns

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

[2] t_{on} is the same as t_{PZH} and t_{PZL} .

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

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

N = number of inputs switching;

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

C_L = output load capacitance in pF;

C_{sw} = switch capacitance in pF;

V_{CC} = supply voltage in V.

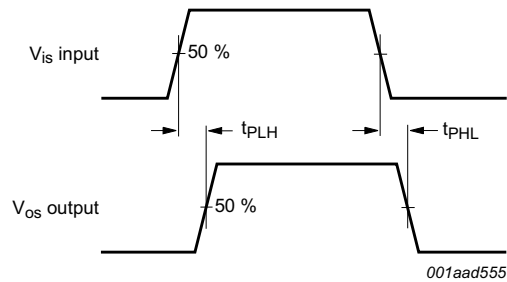
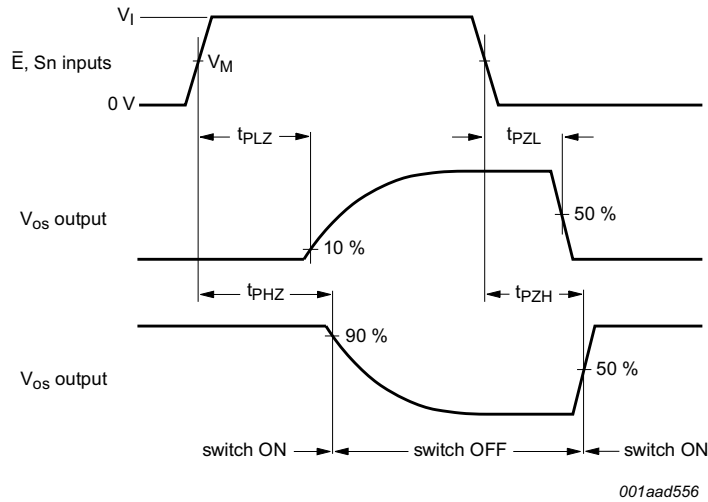
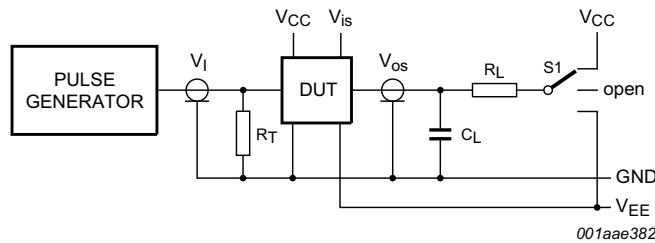
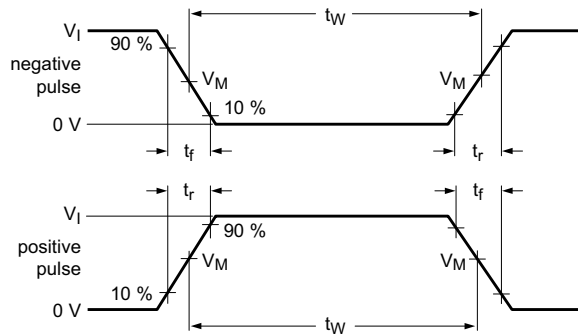


Fig 13. Input (V_{is}) to output (V_{os}) propagation delays



For 74HC4051: $V_M = 0.5 \times V_{CC}$.
 For 74HCT4051: $V_M = 1.3 \text{ V}$.

Fig 14. Turn-on and turn-off times



Definitions for test circuit; see [Table 11](#):

R_T = termination resistance should be equal to the 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 15. Test circuit for measuring AC performance

Table 11. Test data

Test	Input				Load		S1 position
	V_I	V_{is}	t_r, t_f		C_L	R_L	
			at f_{max}	other ^[1]			
t_{PHL}, t_{PLH}	[2]	pulse	< 2 ns	6 ns	50 pF	1 k Ω	open
t_{PZH}, t_{PHZ}	[2]	V_{CC}	< 2 ns	6 ns	50 pF	1 k Ω	V_{EE}
t_{PZL}, t_{PLZ}	[2]	V_{EE}	< 2 ns	6 ns	50 pF	1 k Ω	V_{CC}

[1] $t_r = t_f = 6$ ns; when measuring f_{max} , there is no constraint to t_r and t_f with 50 % duty factor.

[2] V_I values:

- a) For 74HC4051: $V_I = V_{CC}$
- b) For 74HCT4051: $V_I = 3$ V

11.1 Additional dynamic characteristics

Table 12. Additional dynamic characteristics

Recommended conditions and typical values; GND = 0 V; T_{amb} = 25 °C; C_L = 50 pF.

V_{is} is the input voltage at pins nYn or nZ, whichever is assigned as an input.

V_{os} is the output voltage at pins nYn or nZ, whichever is assigned as an output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
d _{sin}	sine-wave distortion	f _i = 1 kHz; R _L = 10 kΩ; see Figure 16					
		V _{is} = 4.0 V (p-p); V _{CC} = 2.25 V; V _{EE} = -2.25 V	-	0.04	-	%	
		V _{is} = 8.0 V (p-p); V _{CC} = 4.5 V; V _{EE} = -4.5 V	-	0.02	-	%	
		f _i = 10 kHz; R _L = 10 kΩ; see Figure 16					
		V _{is} = 4.0 V (p-p); V _{CC} = 2.25 V; V _{EE} = -2.25 V	-	0.12	-	%	
		V _{is} = 8.0 V (p-p); V _{CC} = 4.5 V; V _{EE} = -4.5 V	-	0.06	-	%	
α _{iso}	isolation (OFF-state)	R _L = 600 Ω; f _i = 1 MHz; see Figure 17					
		V _{CC} = 2.25 V; V _{EE} = -2.25 V	[1]	-50	-	dB	
		V _{CC} = 4.5 V; V _{EE} = -4.5 V	[1]	-50	-	dB	
V _{ct}	crosstalk voltage	peak-to-peak value; between control and any switch; R _L = 600 Ω; f _i = 1 MHz; \bar{E} or Sn square wave between V _{CC} and GND; t _r = t _f = 6 ns; see Figure 18					
		V _{CC} = 4.5 V; V _{EE} = 0 V	-	110	-	mV	
		V _{CC} = 4.5 V; V _{EE} = -4.5 V	-	220	-	mV	
f _(-3dB)	-3 dB frequency response	R _L = 50 Ω; see Figure 19					
		V _{CC} = 2.25 V; V _{EE} = -2.25 V	[2]	-	170	-	MHz
		V _{CC} = 4.5 V; V _{EE} = -4.5 V	[2]	-	180	-	MHz

- [1] Adjust input voltage V_{is} to 0 dBm level (0 dBm = 1 mW into 600 Ω).
- [2] Adjust input voltage V_{is} to 0 dBm level at V_{os} for 1 MHz (0 dBm = 1 mW into 50 Ω).

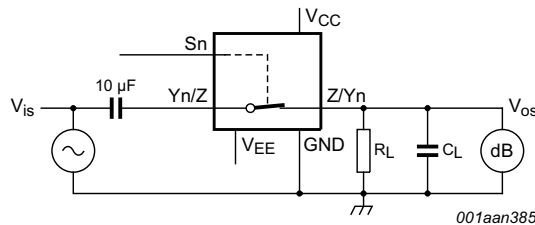
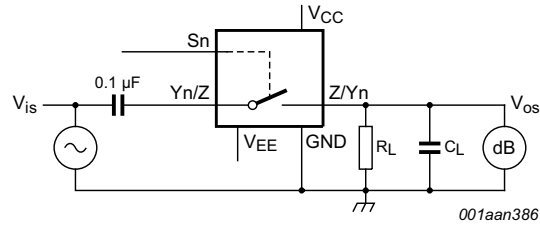
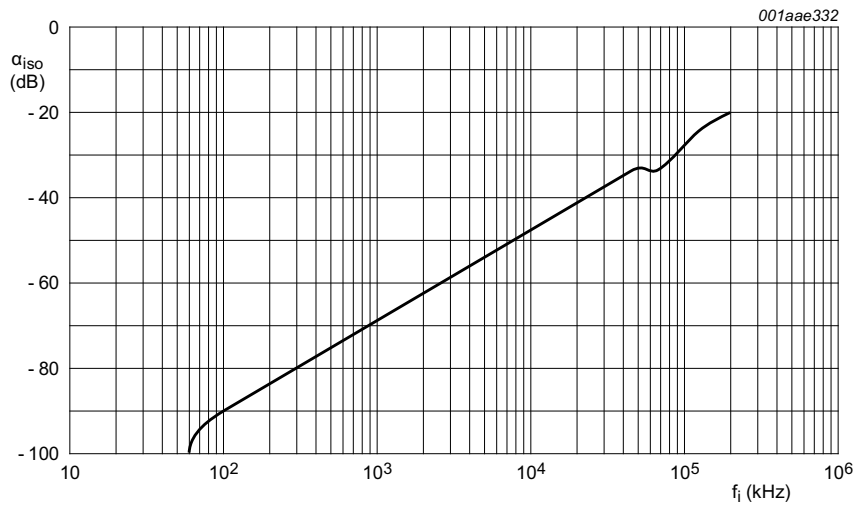


Fig 16. Test circuit for measuring sine-wave distortion



$V_{CC} = 4.5\text{ V}$; $GND = 0\text{ V}$; $V_{EE} = -4.5\text{ V}$; $R_L = 600\ \Omega$; $R_S = 1\text{ k}\Omega$.

a. Test circuit



b. Isolation (OFF-state) as a function of frequency

Fig 17. Test circuit for measuring isolation (OFF-state)

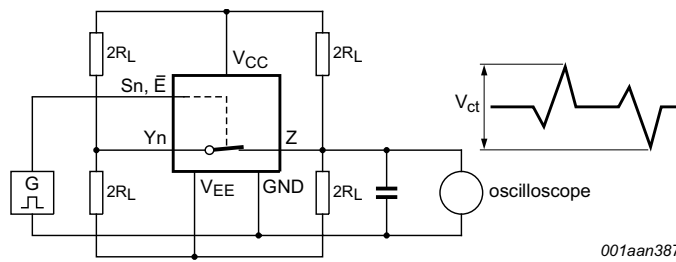
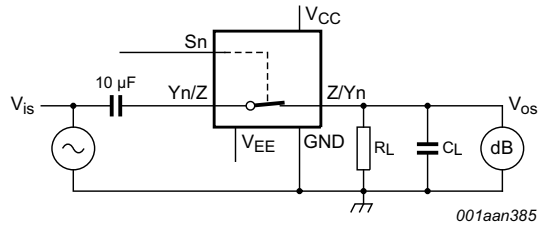
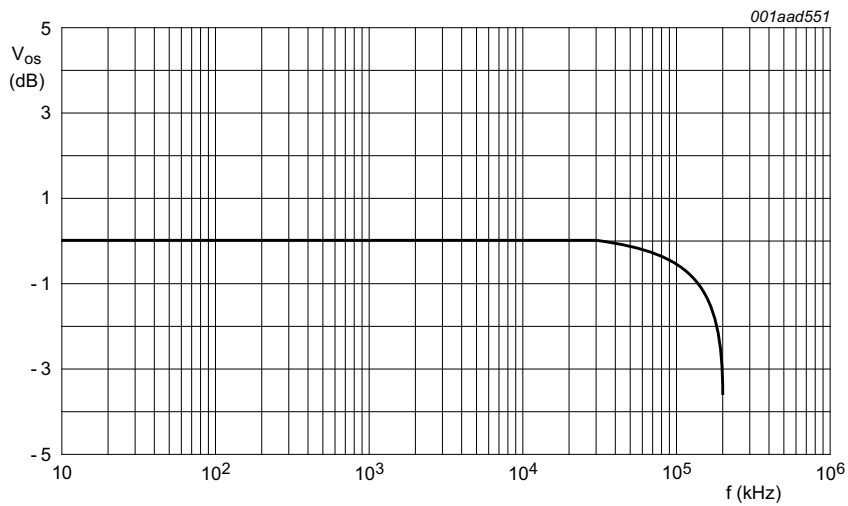


Fig 18. Test circuit for measuring crosstalk between control input and any switch



$V_{CC} = 4.5\text{ V}$; $GND = 0\text{ V}$; $V_{EE} = -4.5\text{ V}$; $R_L = 50\ \Omega$; $R_S = 1\text{ k}\Omega$.

a. Test circuit



b. Typical frequency response

Fig 19. Test circuit for frequency response

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

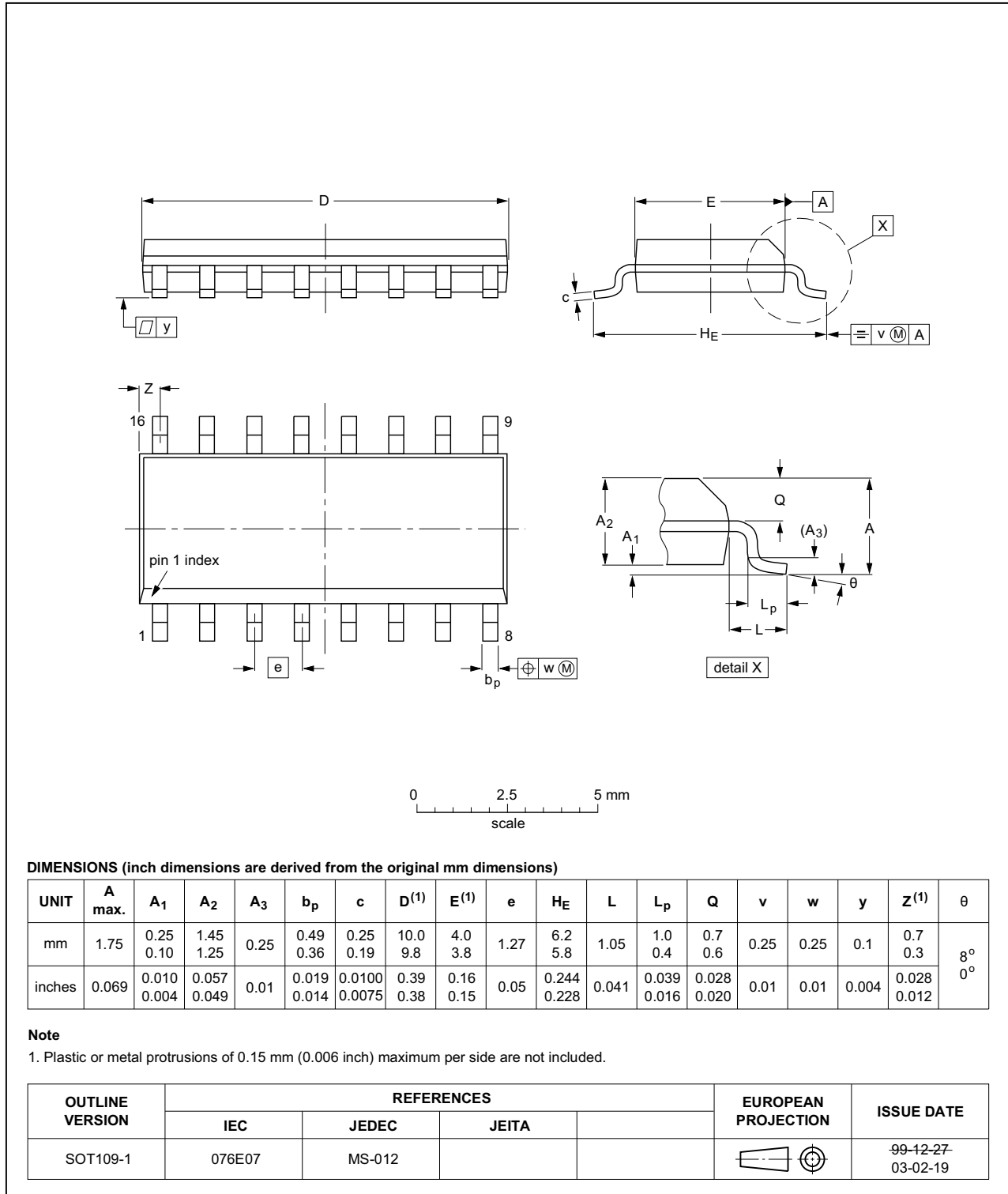


Fig 20. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

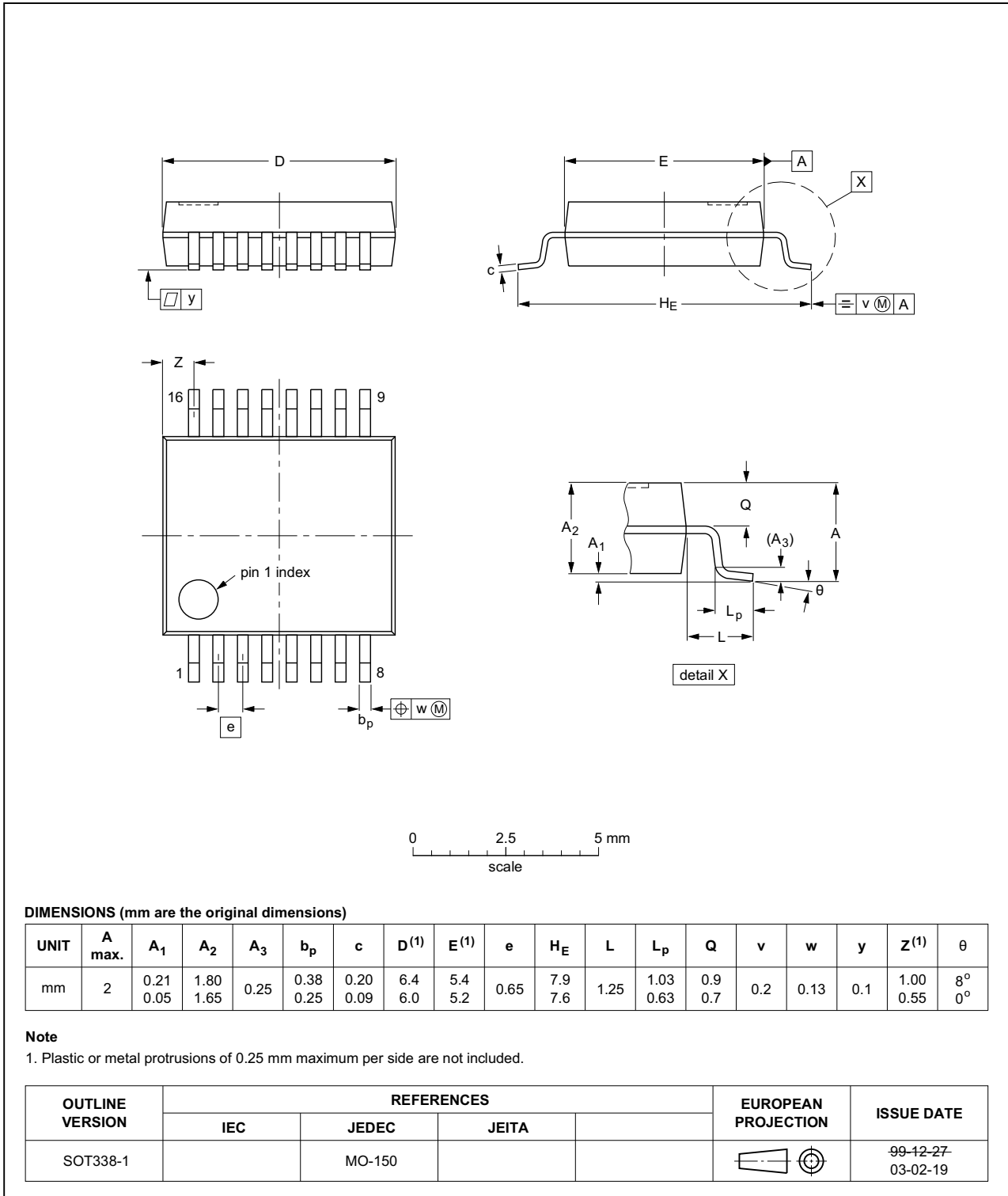


Fig 21. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

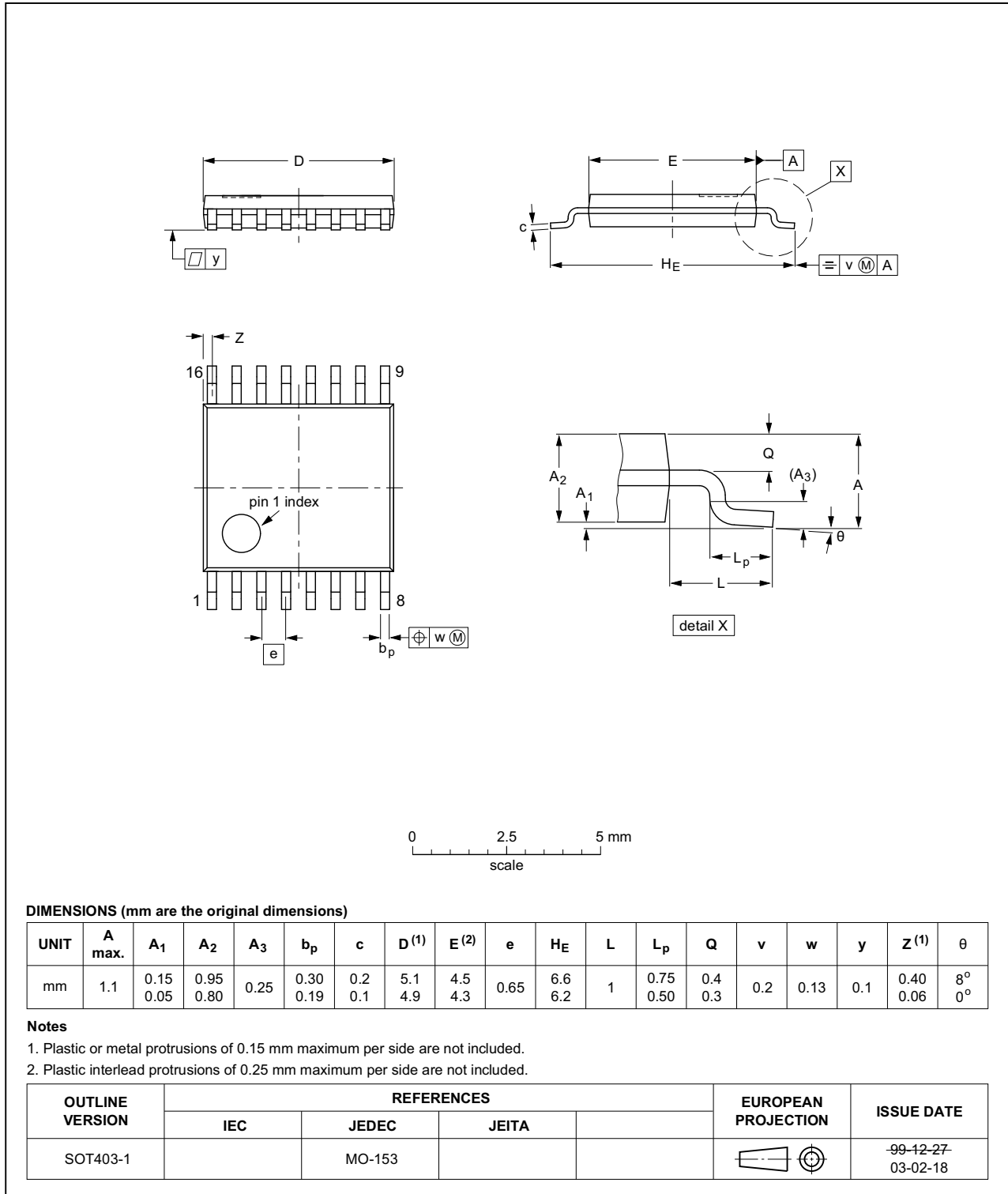


Fig 22. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

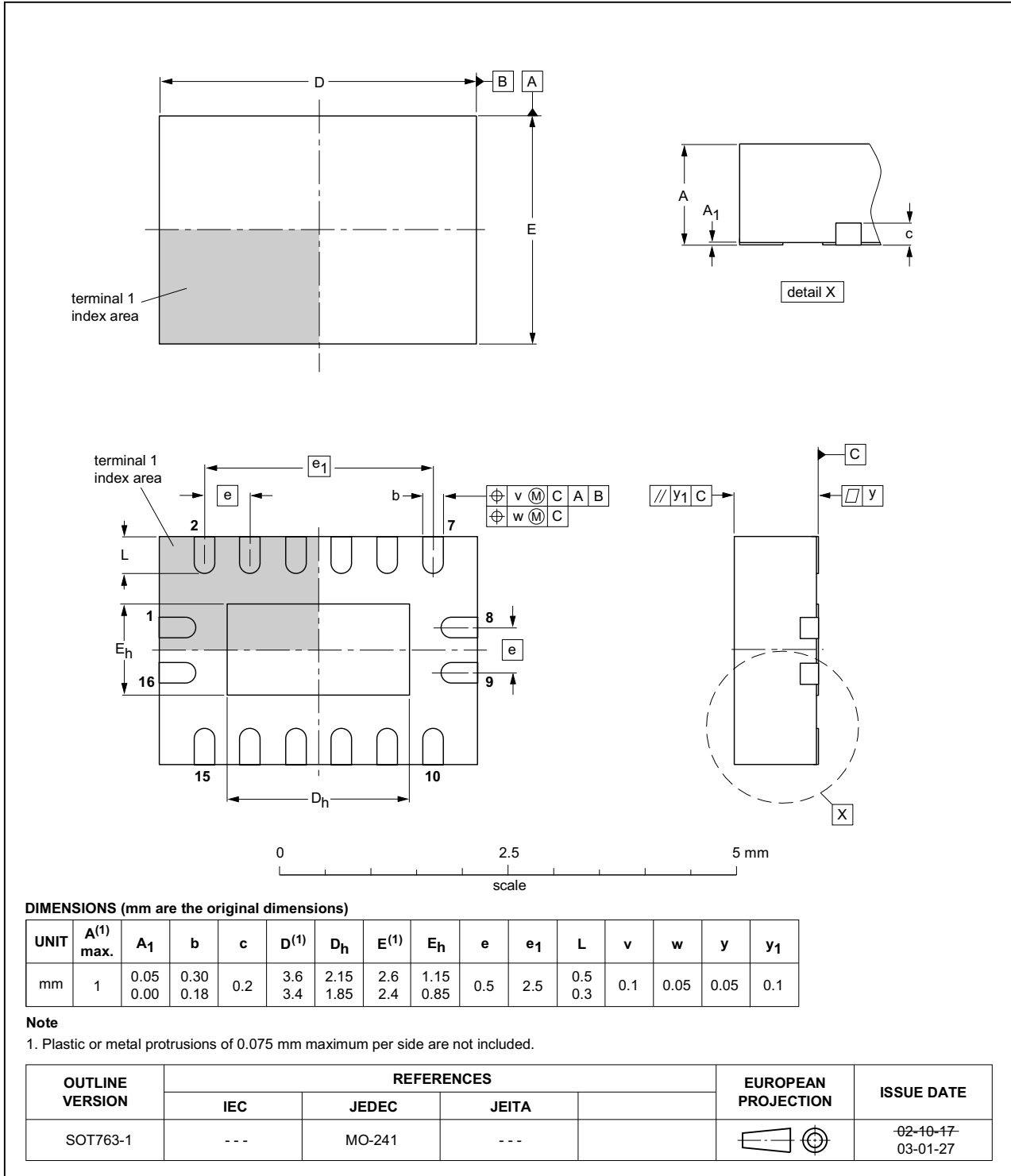


Fig 23. Package outline SOT763-1 (DHVQFN16)

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

14. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4051 v.8	20160205	Product data sheet	-	74HC_HCT4051 v.7
Modifications:	<ul style="list-style-type: none"> Type numbers 74HC4051N and 74HCT4051N (SOT38-4) removed. 			
74HC_HCT4051 v.7	20120719	Product data sheet	-	74HC_HCT4051 v.6
Modifications:	<ul style="list-style-type: none"> CDM added to features. 			
74HC_HCT4051 v.6	20111213	Product data sheet	-	74HC_HCT4051 v.5
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74HC_HCT4051 v.5	20110513	Product data sheet	-	74HC_HCT4051 v.4
74HC_HCT4051 v.4	20110117	Product data sheet	-	74HC_HCT4051 v.3
74HC_HCT4051 v.3	20051219	Product specification	-	74HC_HCT4051_CNV_2

15. Legal information

15.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	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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