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Kind regards,

Team Nexperia

74HC1G66; 74HCT1G66

Single-pole single-throw analog switch Rev. 04 — 19 December 2008

Product data sheet

General description 1.

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

The non-standard output currents are equal to those of the 74HC4066 and 74HCT4066.

2. **Features**

- Wide supply voltage range from 2.0 V to 10.0 V for the 74HC1G66
- Very low ON resistance:
 - 45 Ω (typ.) at $V_{CC} = 4.5 \text{ V}$
 - ◆ 30 Ω (typ.) at V_{CC} = 6.0 V
 - 25 Ω (typ.) at $V_{CC} = 9.0 \text{ V}$
- High noise immunity
- Low power dissipation
- Multiple package options
- ESD protection:
 - ◆ HBM JESD22-A114E exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

Ordering information 3.

Ordering information Table 1.

Type number	ber Package							
	Temperature range	Name	Description	Version				
74HC1G66GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package;	SOT353-1				
74HCT1G66GW			5 leads; body width 1.25 mm					
74HC1G66GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74HCT1G66GV								

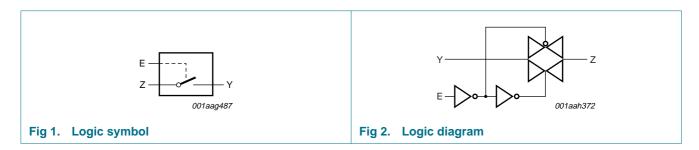


4. Marking

Table 2. Marking codes

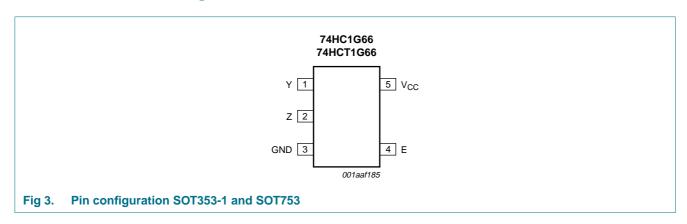
Type number	Marking
74HC1G66GW	HL
74HCT1G66GW	TL
74HC1G66GV	H66
74HCT1G66GV	T66

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

	<u> </u>	
Symbol	Pin	Description
Υ	1	independent input or output
Z	2	independent input or output
GND	3	ground (0 V)
E	4	enable input (active HIGH)
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table^[1]

Input E	Switch
L	OFF
Н	ON

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

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	+11.0	V
I _{IK}	input clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±20	mA
I _{SK}	switch clamping current	$V_I < -0.5 \text{ V or } V_I > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±20	mA
I _{SW}	switch current	V_{SW} > -0.5 V or V_{SW} < V_{CC} + 0.5 V	-	±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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[2] _	250	mW

^[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V).[1]

Symbol	Parameter	Conditions	7	4HC1G6	6	74	4HCT1G	66	Unit
			Min	Тур	Max	Min	Тур	Max	
V_{CC}	supply voltage		2.0	5.0	10.0	4.5	5.0	5.5	V
V_{I}	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_{SW}	switch voltage		0	-	V_{CC}	0	-	V_{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise	$V_{CC} = 2.0 \text{ V}$	-	-	625	-	-	-	ns/V
	and fall rate	$V_{CC} = 4.5 \text{ V}$	-	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

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

^[2] For TSSOP5 and SC-74A packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

10. Static characteristics

Table 7. Static characteristics

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

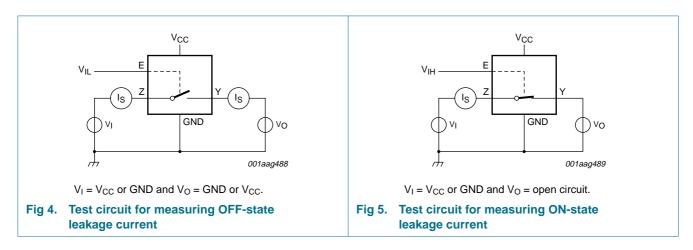
Symbol	Parameter	Conditions	-40	°C to +8	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
74HC1G	66							
V_{IH}	HIGH-level input	$V_{CC} = 2.0 \text{ V}$	1.5	1.2	-	1.5	-	V
	voltage	V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	V
		V _{CC} = 9.0 V	6.3	4.7	-	6.3	-	V
V_{IL}	LOW-level input	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	V
	voltage	V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	V
		V _{CC} = 9.0 V	-	4.3	2.7	-	2.7	V
II	input leakage	E; $V_I = V_{CC}$ or GND						
	current	V _{CC} = 6.0 V	-	0.1	1.0	-	1.0	μΑ
		V _{CC} = 10.0 V	-	0.2	2.0	-	2.0	μΑ
I _{S(OFF)}	OFF-state leakage current	Y or Z; $V_{CC} = 10 \text{ V}$; see Figure 4	-	0.1	1.0	-	1.0	μΑ
I _{S(ON)}	ON-state leakage current	Y or Z; $V_{CC} = 10 \text{ V}$; see Figure 5	-	0.1	1.0	-	1.0	μΑ
I _{CC}	supply current	E, Y or Z; $V_I = V_{CC}$ or GND; $V_{SW} = GND$ or V_{CC}						
		V _{CC} = 6.0 V	-	1.0	10	-	20	μΑ
		V _{CC} = 10.0 V	-	2.0	20	-	40	μΑ
C _I	input capacitance		-	1.5	-	-	-	pF
C _{S(ON)}	ON-state capacitance		-	8	-	-	-	pF

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

Symbol	Parameter	Conditions	-40	°C to +8	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
74HCT1	G66				,			
V_{IH}	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	1.6	-	2.0	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	0.1	1.2	8.0	-	0.8	V
Iį	input leakage current	E; $V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	0.1	1.0	-	1.0	μΑ
I _{S(OFF)}	OFF-state leakage current	Y or Z; $V_{CC} = 5.5 \text{ V}$; see Figure 4	-	0.1	1.0	-	1.0	μΑ
I _{S(ON)}	ON-state leakage current	Y or Z; $V_{CC} = 5.5 \text{ V}$; see Figure 5	-	0.1	1.0	-	1.0	μΑ
I _{CC}	supply current	E, Y or Z; $V_1 = V_{CC}$ or GND; $V_{SW} = GND$ or V_{CC} ; $V_{CC} = 4.5$ V to 5.5 V	-	1	10	-	20	μΑ
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 2.1$ V; $V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A	-	-	500	-	850	μΑ
Cı	input capacitance		-	1.5	-	-	-	pF
C _{S(ON)}	ON-state capacitance		-	8	-	-	-	pF

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

10.1 Test circuits



10.2 ON resistance

Table 8. ON resistance

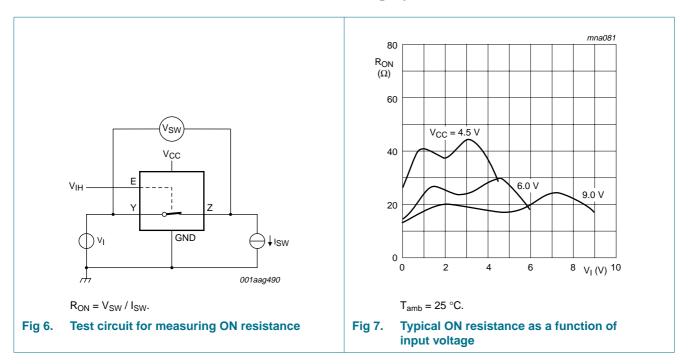
At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graph see Figure 7.

Symbol	Parameter	Conditions	-40	°C to +8	5 °C	–40 °C t	o +125 °C	Unit
			Min	Typ[2]	Max	Min	Max	
74HC1G6	6 <mark>[1]</mark>							
R _{ON(peak)} ON resist (peak)	ON resistance	$V_I = GND$ to V_{CC} ; see Figure 6						
	(peak)	$I_{SW} = 0.1 \text{ mA}; V_{CC} = 2.0 \text{ V}$	-	-	-	-	-	Ω
		$I_{SW} = 1 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	42	118	-	142	Ω
		$I_{SW} = 1 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	31	105	-	126	Ω
		$I_{SW} = 1 \text{ mA}; V_{CC} = 9.0 \text{ V}$	-	23	88	-	105	Ω
R _{ON(rail)}	ON resistance (rail)	V _I = GND; see <u>Figure 6</u>						
		$I_{SW} = 0.1 \text{ mA}; V_{CC} = 2.0 \text{ V}$	-	75	-	-	-	Ω
		I_{SW} = 1 mA; V_{CC} = 4.5 V	-	29	95	-	115	Ω
		I_{SW} = 1 mA; V_{CC} = 6.0 V	-	23	82	-	100	Ω
		I_{SW} = 1 mA; V_{CC} = 9.0 V	-	18	70	-	80	Ω
		V _I = V _{CC} ; see <u>Figure 6</u>						
		I_{SW} = 0.1 mA; V_{CC} = 2.0 V	-	75	-	-	-	Ω
		$I_{SW} = 1 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	35	106	-	128	Ω
		$I_{SW} = 1 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	27	94	-	113	Ω
		I_{SW} = 1 mA; V_{CC} = 9.0 V	-	21	78	-	95	Ω
74HCT16	666							
R _{ON(peak)}	ON resistance	$V_I = GND \text{ to } V_{CC}; \text{ see } \underline{\text{Figure 6}}$						
	(peak)	$I_{SW} = 1 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	42	118	-	142	Ω
R _{ON(rail)}	ON resistance (rail)	V _I = GND; see <u>Figure 6</u>						
		I_{SW} = 1 mA; V_{CC} = 4.5 V	-	29	95	-	115	Ω
		$V_I = V_{CC}$; see Figure 6						
		$I_{SW} = 1 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	35	106	-	128	Ω

^[1] At supply voltages approaching 2 V, the ON resistance becomes extremely non-linear. Therefore it is recommended that these devices be used to transmit digital signals only, when using this supply voltage.

^[2] Typical values are measured at T_{amb} = 25 °C.

10.3 ON resistance test circuit and graphs



11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF; $R_L = 1$ k Ω , unless otherwise specified; For test circuit see Figure 10.

Symbol	Parameter	Conditions		-40	°C to +8	5 °C	–40 °C t	o +125 °C	Unit
			Min	Typ[1]	Max	Min	Max		
74HC1G	666								
t _{pd} propagation de	propagation delay	Y to Z or Z to Y; $R_L = \infty \Omega$; see Figure 8	[2]						
		$V_{CC} = 2.0 \text{ V}$		-	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 V		-	1	10	-	12	ns
t _{en}	enable time	E to Y or Z; see Figure 9	[2]						
		$V_{CC} = 2.0 \text{ V}$		-	50	125	-	150	ns
		$V_{CC} = 4.5 \text{ V}$		-	16	25	-	30	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	11	-	-	-	ns
		$V_{CC} = 6.0 \text{ V}$		-	13	21	-	26	ns
		$V_{CC} = 9.0 \text{ V}$		-	9	16	-	20	ns

 Table 9.
 Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); $C_L = 50 \text{ pF}$; $R_L = 1 \text{ k}\Omega$, unless otherwise specified; For test circuit see Figure 10.

Symbol	Parameter	Conditions		-40	$-40~^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$			-40 °C to +125 °C		
				Min	Typ[1]	Max	Min	Max		
t _{dis}	disable time	E to Y or Z; see Figure 9	[2]							
		$V_{CC} = 2.0 \text{ V}$		-	27	190	-	225	ns	
		$V_{CC} = 4.5 \text{ V}$		-	16	38	-	45	ns	
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	11	-	-	-	ns	
		$V_{CC} = 6.0 \text{ V}$		-	14	33	-	38	ns	
		$V_{CC} = 9.0 V$		-	12	16	-	20	ns	
C_{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}$	[3]	-	9	-	-	-	pF	
74HCT1	G66									
t _{pd}	propagation delay	Y to Z or Z to Y; $R_L = \infty \Omega$; see Figure 8	[2]							
		V _{CC} = 4.5 V		-	3	15	-	18	ns	
t _{en}	enable time	E to Y or Z; see Figure 9	[2]							
		V _{CC} = 4.5 V		-	15	30	-	36	ns	
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	12	-	-	-	ns	
t _{dis}	disable time	E to Y or Z; see Figure 9	[2]							
		$V_{CC} = 4.5 \text{ V}$		-	13	44	-	53	ns	
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		-	12	-	-	-	ns	
C_{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC} - 1.5 \text{ V}$	<u>[3]</u>	-	9	-	-	-	pF	

^[1] All typical values are measured at T_{amb} = 25 °C.

 t_{en} is the same as t_{PZL} and t_{PZH} .

 $t_{\mbox{\scriptsize dis}}$ is the same as $t_{\mbox{\scriptsize PLZ}}$ and $t_{\mbox{\scriptsize PHZ}}.$

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

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

 f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

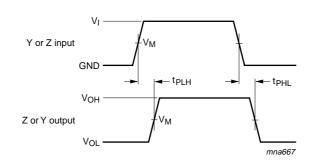
 C_{SW} = maximum switch capacitance in pF (see <u>Table 7</u>);

 V_{CC} = supply voltage in Volt;

 $\Sigma ((C_L \times C_{SW}) \times V_{CC}^2 \times f_o) = \text{sum of outputs.}$

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

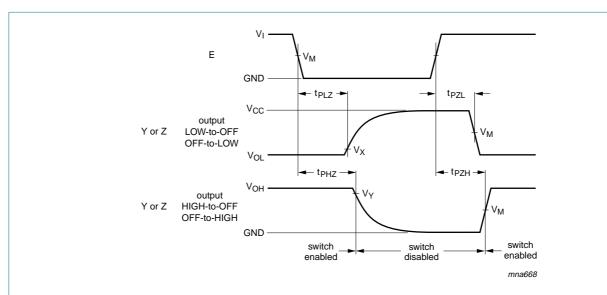
11.1 Waveforms and test circuit



Measurement points are given in Table 10.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 8. Input (Y or Z) to output (Z or Y) propagation delays



Measurement points are given in Table 10.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 9. Enable and disable times

Table 10. Measurement points

Туре	Input	Output	Dutput				
	V _M	V _M	V _X	V _Y			
74HC1G66	0.5V _{CC}	0.5V _{CC}	V _{OL} + 10%	V _{OH} – 10%			
74HCT1G66	1.3 V	1.3 V	V _{OL} + 10%	V _{OH} – 10%			

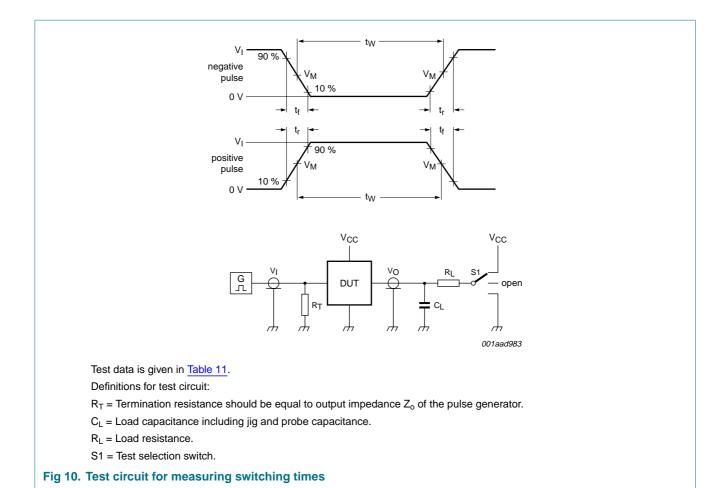


Table 11. Test data

Туре	Input		Load		S1 position				
	VI	t _r , t _f [1]	CL	R _L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}		
74HC1G66	GND to V _{CC}	6 ns	50 pF, 15 pF	1 k Ω , ∞ Ω	open	GND	V _{CC}		
74HCT1G66	GND to 3 V	6 ns	50 pF, 15 pF	1 k Ω , ∞ Ω	open	GND	V _{CC}		

^[1] There is no constraint on t_r, t_f with a 50% duty factor when measuring f_{max}.

11.2 Additional dynamic characteristics

Table 12. Additional dynamic characteristics for 74HC1G66 and 74HCT1G66 $GND = 0 \ V$; $t_r = t_f = 6.0 \ ns$; $C_L = 50 \ pF$; unless otherwise specified. All typical values are measured at $T_{amb} = 25 \ ^{\circ}C$.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
distortion		$f_i = 1 \text{ kHz}$; $R_L = 10 \text{ k}\Omega$; see Figure 11				%
	$V_{CC} = 4.5 \text{ V}; V_I = 4.0 \text{ V (p-p)}$	-	0.04	-	%	
	$V_{CC} = 9.0 \text{ V}; V_I = 8.0 \text{ V (p-p)}$	-	0.02	-	%	
		f_i = 10 kHz; R_L = 10 k Ω ; see Figure 11				
		$V_{CC} = 4.5 \text{ V}; V_I = 4.0 \text{ V (p-p)}$	-	0.12	-	%
		$V_{CC} = 9.0 \text{ V}; V_I = 8.0 \text{ V (p-p)}$	-	0.06	-	%

Table 12. Additional dynamic characteristics for 74HC1G66 and 74HCT1G66 ...continued

GND = 0 V; $t_r = t_f = 6.0$ ns; $C_L = 50$ pF; unless otherwise specified. All typical values are measured at $T_{amb} = 25$ °C.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$f_{(-3dB)}$	-3 dB frequency	$R_L = 50 \Omega$; $C_L = 10 pF$; see Figure 12 and 13				
response	response	V _{CC} = 4.5 V	-	180	-	MHz
		V _{CC} = 9.0 V	-	200	-	MHz
α_{iso}	isolation (OFF-state)	$R_L = 600 \Omega$; $f_i = 1 MHz$; see Figure 14 and 15				
		V _{CC} = 4.5 V	-	-50	-	dB
		V _{CC} = 9.0 V	-	-50	-	dB

11.3 Test circuits and graphs

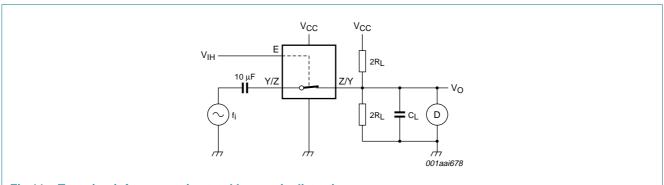
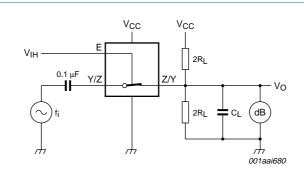
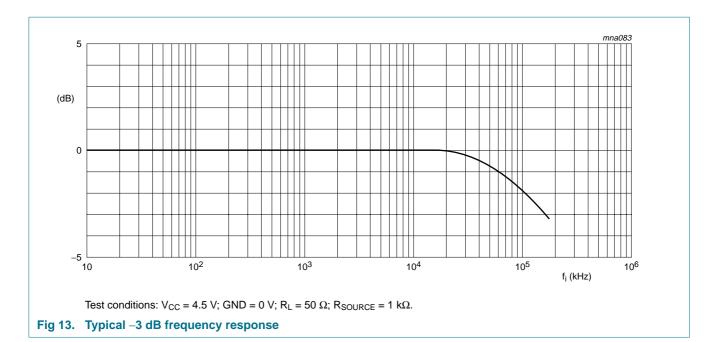


Fig 11. Test circuit for measuring total harmonic distortion



With f_i = 1 MHz adjust the switch input voltage for a 0 dBm level at the switch output, (0 dBm = 1 mW into 50 Ω). Then Increase the input frequency until the dB meter reads -3 dB

Fig 12. Test circuit for measuring the -3 dB frequency response



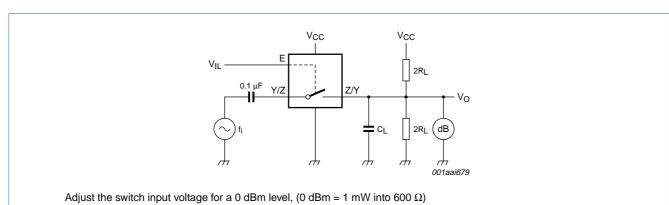
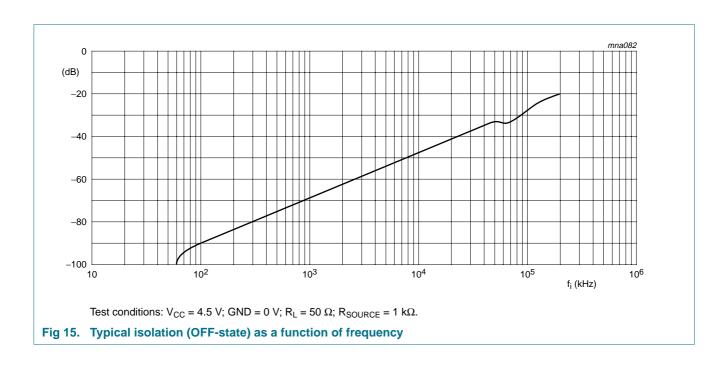


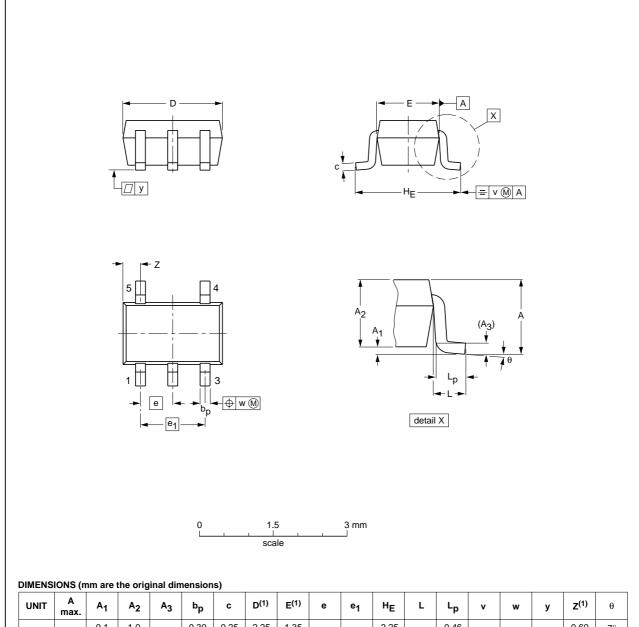
Fig 14. Test circuit for measuring isolation (OFF-state)



12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	C	D ⁽¹⁾	E ⁽¹⁾	е	e ₁	HE	L	Lp	٧	w	у	Z ⁽¹⁾	θ	
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°	

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

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT353-1		MO-203	SC-88A			-00-09-01 03-02-19

Fig 16. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

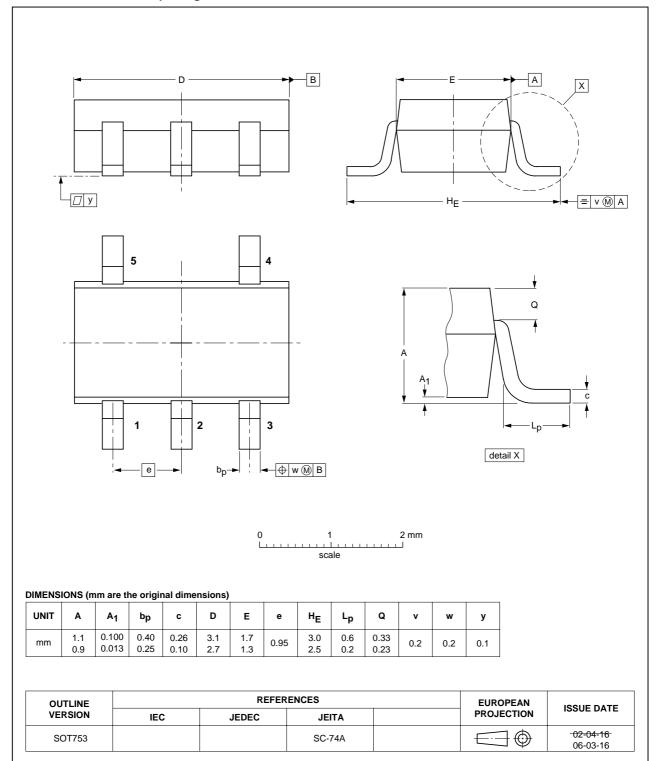


Fig 17. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 13. Abbreviations

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

14. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT1G66_4	20081219	Product data sheet	-	74HC_HCT1G66_3
Modifications:		of this data sheet has been red NXP Semiconductors.	esigned to comply w	ith the new identity
	 Legal texts h 	ave been adapted to the new	company name whe	re appropriate.
	 Package SO 	T353 changed to SOT353-1 in	Table 1 and Figure	<u>16</u> .
	 Quick Refere 	ence Data and Soldering section	ons removed.	
	 Section 2 "Fe 	eatures" updated.		
74HC_HCT1G66_3	20020515	Product specification	-	74HC_HCT1G66_2
74HC_HCT1G66_2	20010302	Product specification	-	74HC_HCT1G66_1
74HC_HCT1G66_1	19980803	Product specification	-	-

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"
- [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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