74HC3G06; 74HCT3G06

Triple inverter with open-drain outputs Rev. 4 — 19 December 2013

Product data sheet

1. **General description**

The 74HC3G06; 74HCT3G06 is a triple inverter with open-drain outputs. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

Features and benefits 2.

- Wide supply voltage range from 2.0 V to 6.0 V
- Input levels:
 - ◆ For 74HC3G06: CMOS level
 - ◆ For 74HCT3G06: TTL level
- Complies with JEDEC standard no. 7A
- High noise immunity
- Low power dissipation
- Multiple package options
- ESD protection:
 - ◆ HBM JESD22-A114F 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.

Table 1. **Ordering information**

Type number	Package								
	Temperature range	Name	Description	Version					
74HC3G06DP	–40 °C to +125 °C	TSSOP8	SSOP8 plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm						
74HCT3G06DP									
74HC3G06DC	–40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads;	SOT765-1					
74HCT3G06DC			body width 2.3 mm						
74HC3G06GD	–40 °C to +125 °C	XSON8	piacia chia cina di mare paciage, ne reade,						
74HCT3G06GD			8 terminals; body $3 \times 2 \times 0.5$ mm						



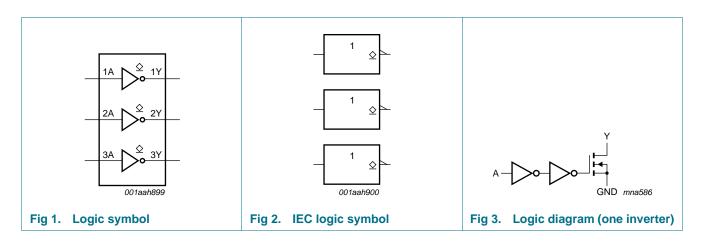
4. Marking

Table 2. Marking code

Type number	Marking code ^[1]
74HC3G06DP	H06
74HCT3G06DP	T06
74HC3G06DC	H06
74HCT3G06DC	T06
74HC3G06GD	H06
74HCT3G06GD	T06

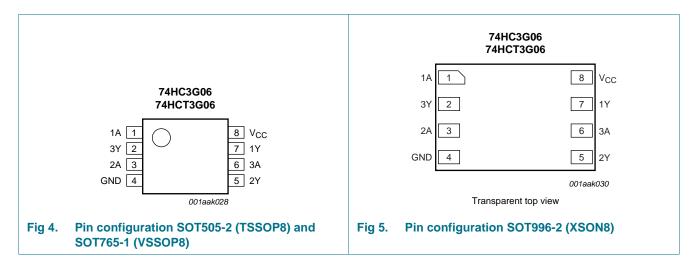
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1A, 2A, 3A	1, 3, 6	data input
GND	4	ground (0 V)
1Y, 2Y, 3Y	7, 5, 2	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table[1]

Input nA	Output nY
L	Z
Н	L

^[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

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	7.0	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 _{OK}	output clamping current	$V_O < -0.5 \text{ V}$	<u>[1]</u> –20	-	mA
Vo	output voltage	active mode	<u>[1]</u> –0.5	$V_{CC} + 0.5$	V
		high-impedance mode	<u>[1]</u> –0.5	7.0	V
Io	output current	$V_O = -0.5 \text{ V to } 7.0 \text{ V}$	<u>[1]</u> _	25	mA
I _{CC}	supply current		<u>[1]</u> _	50	mA
I_{GND}	ground current		<u>[1]</u> –50	-	mA
T _{stg}	storage temperature		-65	+150	°C
P_D	dynamic power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[2] -	300	mW

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

^[2] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K. For XSON8 package: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	ool Parameter Conditions		7	74HC3G06		74HCT3G06			Unit
			Min	Тур	Max	Min	Тур	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_{I}	input voltage		0	-	6.0	0	-	5.5	V
Vo	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise	$V_{CC} = 2.0 \text{ V}$	-	-	625	-	-	-	ns/V
	and fall rate	V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 6.0 V	-	-	83	-	-	-	ns/V

10. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T_{amb} = 25 °C.

Symbol	Parameter	Conditions	-40	°C to +8	5 °C	–40 °C t	Unit	
			Min	Typ[1]	Max	Min	Max	
74HC3G	06							
V _{IH}	HIGH-level input	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	V
	voltage	$V_{CC} = 4.5 \text{ V}$	3.15	2.4	-	3.15	-	V
		$V_{CC} = 6.0 \text{ V}$	4.2	3.2	-	4.2	-	V
V_{IL}	LOW-level input	$V_{CC} = 2.0 \text{ V}$	-	0.8	0.5	-	0.5	V
	voltage	$V_{CC} = 4.5 \text{ V}$	-	2.1	1.35	-	1.35	V
		$V_{CC} = 6.0 \text{ V}$	-	2.8	1.8	-	1.8	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = 20 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 6.0 V$	-	0	0.1	-	0.1	V
		I_{O} = 4.0 mA; V_{CC} = 4.5 V	-	0.15	0.33	-	0.4	V
		$I_{O} = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.33	-	0.4	V
I	input leakage current	$V_1 = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	μΑ
I_{LO}	output leakage current	$V_I = V_{IL}$; $V_O = V_{CC}$ or GND	-	-	±5.0	-	±10	μА
I _{CC}	supply current	per input pin; $V_{CC} = 6.0 \text{ V}$; $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$;	-	-	10	-	20	μА
Cı	input capacitance		-	1.5	-	-	-	pF

 Table 7.
 Static characteristics ...continued

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T_{amb} = 25 °C.

Symbol	Parameter	arameter Conditions		0 °C to +8	5 °C	-40 °C 1	to +125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
74HCT30	306						'	'
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	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	1.2	8.0	-	0.8	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = 20 \mu A$; $V_{CC} = 4.5 V$	-	0	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.33	-	0.4	V
I _I	input leakage current	$V_1 = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±1.0	-	±1.0	μА
I _{LO}	output leakage current	$V_I = V_{IL}$; $V_O = V_{CC}$ or GND	-	-	±5.0	-	±10	μА
I _{CC}	supply current	per input pin; $V_{CC} = 5.5 \text{ V}$; $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$;	-	-	10	-	20	μА
ΔI_{CC}	additional supply current	per input; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V};$ $V_I = V_{CC} - 2.1 \text{ V}; I_O = 0 \text{ A}$	-	-	375	-	410	μА
C _I	input capacitance		-	1.5	-	-	-	pF

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); all typical values are measured at T_{amb} = 25 °C; for test circuit see <u>Figure 7</u>.

Symbol	Parameter	Conditions		-40	°C to +8	5 °C	-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	
74HC3G	06	'			•	'	'		
1 22	OFF-state to LOW	nA to nY; see Figure 6							
	propagation delay	$V_{CC} = 2.0 \text{ V}$		-	22	95	-	125	ns
		V _{CC} = 4.5 V		-	9	18	-	25	ns
		V _{CC} = 6.0 V		-	8	16	-	20	ns
t _{PLZ} LOW to C	LOW to OFF-state	nA to nY; see Figure 6							
	propagation delay	V _{CC} = 2.0 V		-	24	95	-	125	ns
		V _{CC} = 4.5 V		-	11	20	-	27	ns
		V _{CC} = 6.0 V		-	10	19	-	23	ns
t_{THL}	HIGH to LOW output	nY; see Figure 6							
	transition time	V _{CC} = 2.0 V		-	18	95	-	125	ns
		V _{CC} = 4.5 V		-	6	19	-	25	ns
		$V_{CC} = 6.0 \text{ V}$		-	5	16	-	20	ns
C_{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}$	<u>[1]</u>	-	4	-	-	-	pF

 Table 8.
 Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); all typical values are measured at T_{amb} = 25 °C; for test circuit see Figure 7.

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	
74HCT30	G06							
t _{PZL} OFF-state to LOW		nA to nY; see Figure 6						
	propagation delay	V _{CC} = 4.5 V	-	9	24	-	29	ns
t _{PLZ}	LOW to OFF-state	nA to nY; see Figure 6						
	propagation delay	V _{CC} = 4.5 V	-	12	27	-	32	ns
t _{THL}	HIGH to LOW output transition time	V _{CC} = 4.5 V; see <u>Figure 6</u>	-	6	19	-	22	ns
C_{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC} - 1.5 \text{ V}$	<u>[1]</u> _	4		-	-	pF

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

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

 f_i = input frequency in MHz;

 f_o = output frequency in MHz;

 C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms

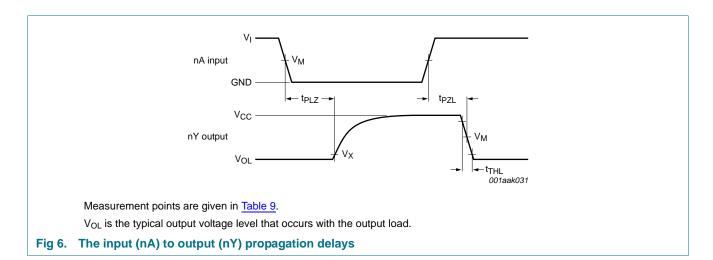
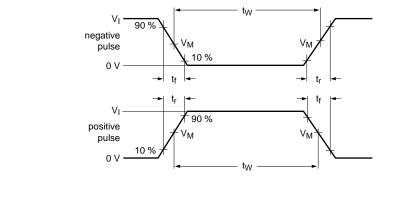
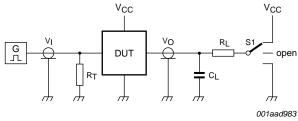


Table 9. Measurement points

Туре	Input	Output V _M			
	V _M				
74HC3G06	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$		
74HCT3G06	1.3 V	1.3 V	0.1 × V _{CC}		





Test data is given in Table 10.

Definitions for test circuit:

 R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

 C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig 7. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position
	V _I	t _r , t _f	C _L	R _L	t _{PZL} , t _{PLZ}
74HC3G06	GND to V _{CC}	≤ 6 ns	50 pF	1 kΩ	V _{CC}
74HCT3G06	GND to 3 V	≤ 6 ns	50 pF	1 kΩ	V _{CC}

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

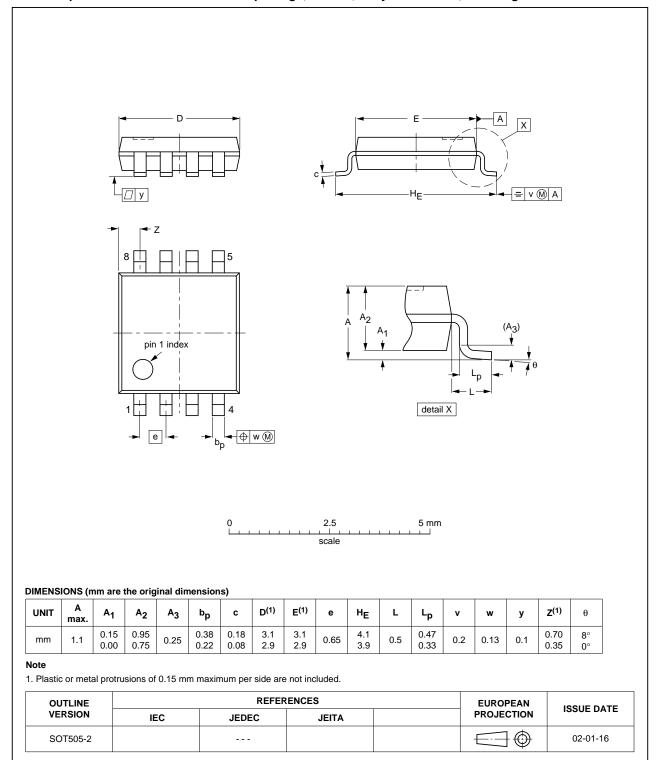
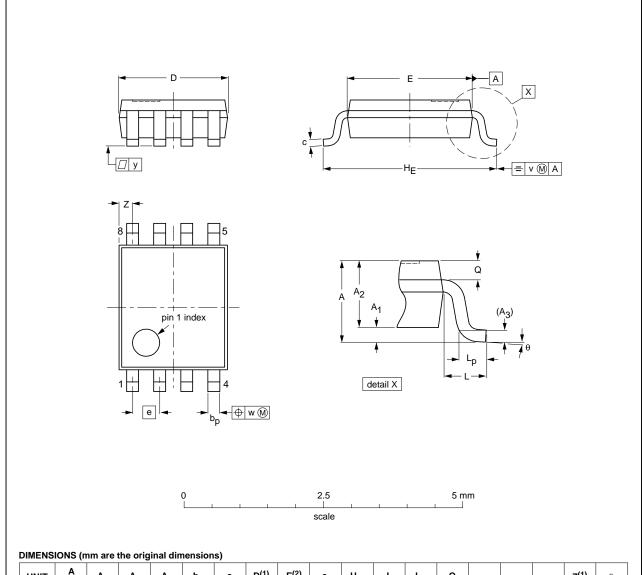


Fig 8. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1



UNIT	A max.	A ₁	A ₂	А3	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lр	Q	v	w	у	Z ⁽¹⁾	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

Notes

- Plastic or metal protrusions of 0.15 mm maximum per side are not included.
 Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT765-1		MO-187				02-06-07	
	•	•		•			

Fig 9. Package outline SOT765-1 (VSSOP8)

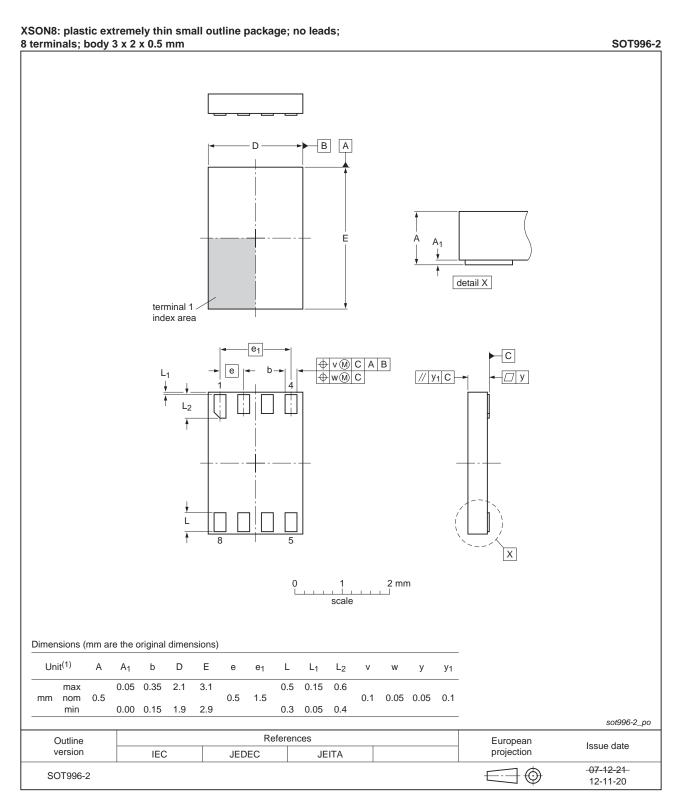


Fig 10. Package outline SOT996-2 (XSON8)

74HC_HCT3G06

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14. Abbreviations

Table 11. Abbreviations

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

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT3G06 v.4	20131219	Product data sheet	-	74HC_HCT3G06 v.3
Modifications:	 For type nu 	mbers 74HC3G06GD and 7	4HCT3G06GD XSON8	U has changed to XSON8.
74HC_HCT3G06 v.3	20090511	Product data sheet	-	74HC_HCT3G06 v.2
74HC_HCT3G06 v.2	20031202	Product specification	-	74HC_HCT3G06 v.1
74HC_HCT3G06 v.1	20030515	Product specification	-	-

16. Legal information

16.1 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.
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