

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} .

2. Features and benefits

- 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 $-40\text{ }^{\circ}\text{C}$ 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			
	Temperature range	Name	Description	Version
74HC3G06DP 74HCT3G06DP	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74HC3G06DC 74HCT3G06DC	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74HC3G06GD 74HCT3G06GD	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body $3 \times 2 \times 0.5$ mm	SOT996-2



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

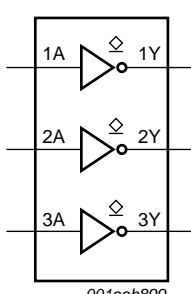


Fig 1. Logic symbol

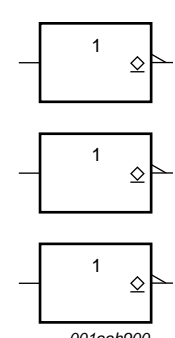


Fig 2. IEC logic symbol

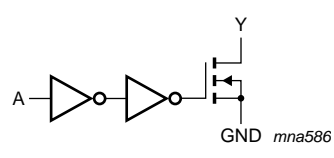


Fig 3. Logic diagram (one inverter)

6. Pinning information

6.1 Pinning

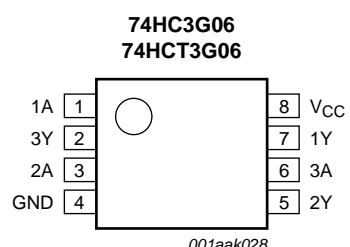


Fig 4. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

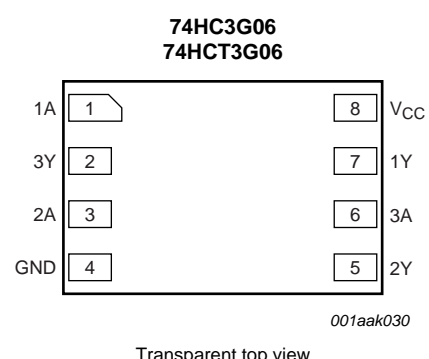


Fig 5. Pin configuration SOT996-2 (XSON8)

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
H	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 $V_I > V_{CC} + 0.5\text{ V}$	[1] -	±20	mA
I _{OK}	output clamping current	$V_O < -0.5\text{ V}$	[1] -20	-	mA
V _O	output voltage	active mode	[1] -0.5	V _{CC} + 0.5	V
		high-impedance mode	[1] -0.5	7.0	V
I _O	output current	$V_O = -0.5\text{ V}$ to 7.0 V	[1] -	25	mA
I _{CC}	supply current		[1] -	50	mA
I _{GND}	ground current		[1] -50	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _D	dynamic power dissipation	T _{amb} = -40 °C to +125 °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	Parameter	Conditions	74HC3G06			74HCT3G06			Unit
			Min	Typ	Max	Min	Typ	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
V _O	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 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

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 +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
74HC3G06								
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	V
		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 _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	V
		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 _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 20 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	V
		I _O = 20 μA; 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 mA; V _{CC} = 6.0 V	-	0.16	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±0.1	-	±1.0	μA
I _{LO}	output leakage current	V _I = V _{IL} ; V _O = V _{CC} or GND	-	-	±5.0	-	±10	μA
I _{CC}	supply current	per input pin; V _{CC} = 6.0 V; V _I = V _{CC} or GND; I _O = 0 A;	-	-	10	-	20	μA
C _I	input capacitance		-	1.5	-	-	-	pF

Table 7. Static characteristics ...continued

Voltages are referenced to GND (ground = 0 V). All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ ^[1]	Max	Min	Max	
74HCT3G06								
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 20 μA; V _{CC} = 4.5 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 _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±1.0	-	±1.0	μA
I _{LO}	output leakage current	V _I = V _{IL} ; V _O = V _{CC} or GND	-	-	±5.0	-	±10	μA
I _{CC}	supply current	per input pin; V _{CC} = 5.5 V; V _I = V _{CC} or GND; I _O = 0 A;	-	-	10	-	20	μA
ΔI _{CC}	additional supply current	per input; V _{CC} = 4.5 V to 5.5 V; V _I = V _{CC} - 2.1 V; I _O = 0 A	-	-	375	-	410	μA
C _I	input capacitance		-	1.5	-	-	-	pF

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); all typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$; for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HC3G06								
t _{PZL}	OFF-state to LOW propagation delay	nA to nY; see Figure 6						
		V _{CC} = 2.0 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 OFF-state propagation delay	nA to nY; see Figure 6						
		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 transition time	nY; see Figure 6						
		V _{CC} = 2.0 V	-	18	95	-	125	ns
		V _{CC} = 4.5 V	-	6	19	-	25	ns
		V _{CC} = 6.0 V	-	5	16	-	20	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC}	^[1]	-	4	-	-	pF

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); all typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$; for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
74HCT3G06								
t_{PZL}	OFF-state to LOW propagation delay	nA to nY; see Figure 6 $V_{CC} = 4.5\text{ V}$	-	9	24	-	29	ns
t_{PLZ}	LOW to OFF-state propagation delay	nA to nY; see Figure 6 $V_{CC} = 4.5\text{ V}$	-	12	27	-	32	ns
t_{THL}	HIGH to LOW output transition time	$V_{CC} = 4.5\text{ V}$; see Figure 6	-	6	19	-	22	ns
C_{PD}	power dissipation capacitance	$V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ [1]	-	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;

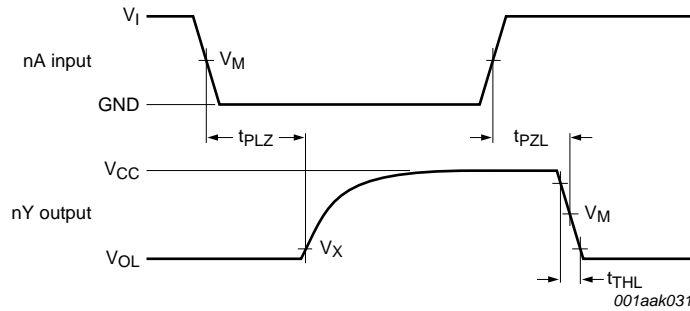
C_L = output load capacitance in pF;

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



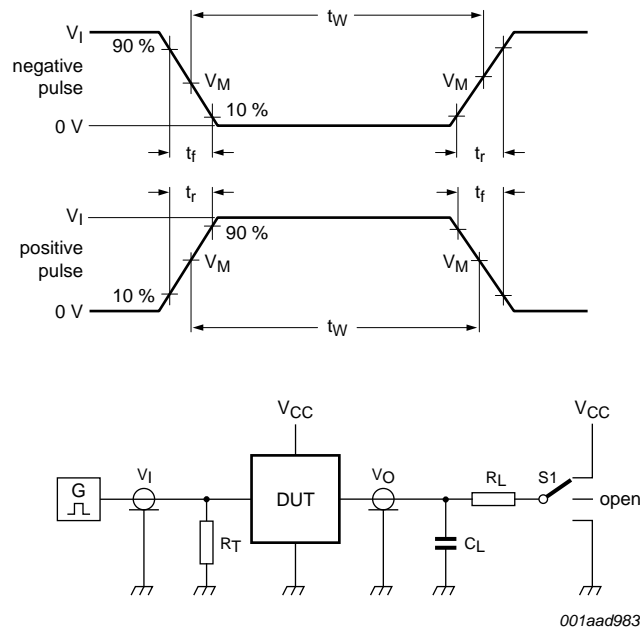
Measurement points are given in [Table 9](#).

V_{OL} is the typical output voltage level that occurs with the output load.

Fig 6. The input (nA) to output (nY) propagation delays

Table 9. Measurement points

Type	Input	Output	
	V_M	V_M	V_X
74HC3G06	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$
74HCT3G06	1.3 V	1.3 V	$0.1 \times V_{CC}$



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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

Type	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 k Ω	V_{CC}	
74HCT3G06	GND to 3 V	≤ 6 ns	50 pF	1 k Ω	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

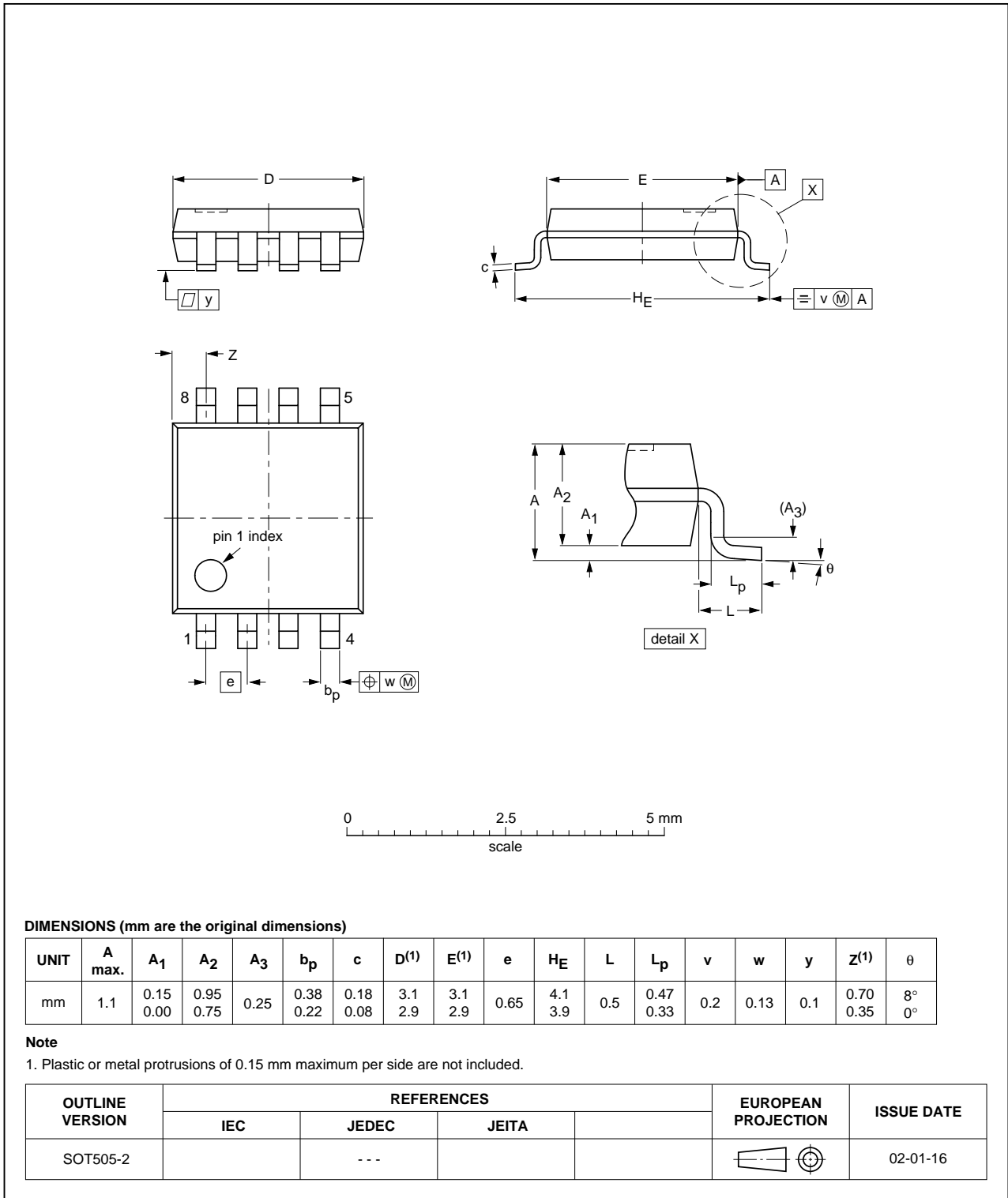


Fig 8. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

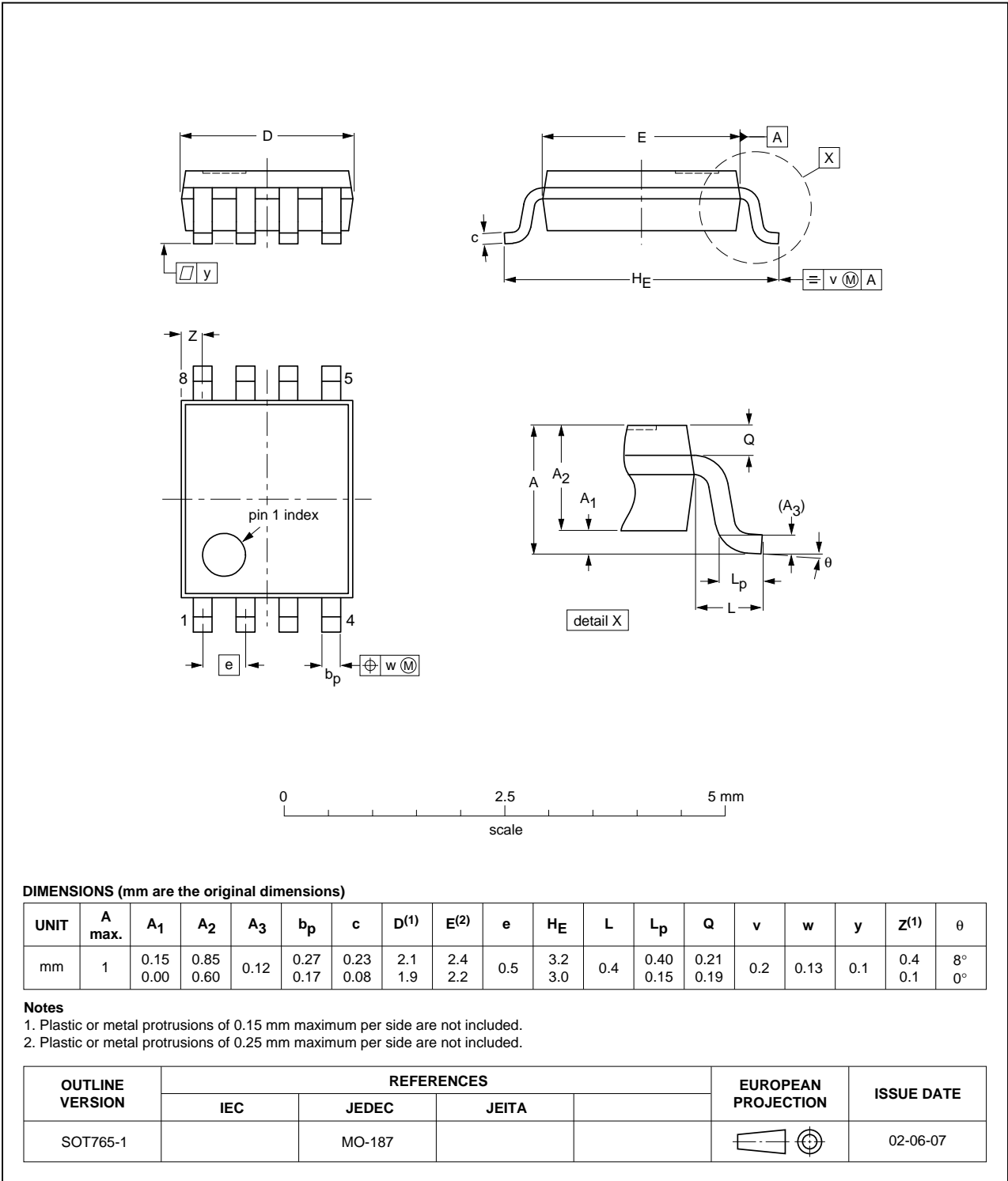


Fig 9. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads;
8 terminals; body 3 x 2 x 0.5 mm

SOT996-2



Fig 10. Package outline SOT996-2 (XSON8)

14. Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	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:	<ul style="list-style-type: none"> For type numbers 74HC3G06GD and 74HCT3G06GD XSON8U 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.
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".

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