# 74LVC3G06

# Triple inverter with open-drain output Rev. 11 — 28 March 2013

**Product data sheet** 

#### 1. **General description**

The 74LVC3G06 provides three inverting buffers.

The output of this device is an open drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

Schmitt trigger action at all inputs makes the circuit tolerant for slower input rise and fall time.

This device is fully specified for partial power-down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

#### Features and benefits 2.

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output for interfacing with 5 V logic
- High noise immunity
- Complies with JEDEC standard:
  - ◆ JESD8-7 (1.65 V to 1.95 V)
  - ◆ JESD8-5 (2.3 V to 2.7 V)
  - ◆ JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- -24 mA output drive ( $V_{CC} = 3.0 \text{ V}$ )
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C



### Triple inverter with open-drain output

# 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC3G06DP	–40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC3G06DC	–40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC3G06GT	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 $\times$ 1.95 $\times$ 0.5 mm	SOT833-1
74LVC3G06GF	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1 \times 0.5$ mm	SOT1089
74LVC3G06GD	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 3 $\times$ 2 $\times$ 0.5 mm	SOT996-2
74LVC3G06GM	–40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 $\times$ 1.6 $\times$ 0.5 mm	SOT902-2
74LVC3G06GN	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 $\times$ 1.0 $\times$ 0.35 mm	SOT1116
74LVC3G06GS	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1.0 \times 0.35$ mm	SOT1203

### 4. Marking

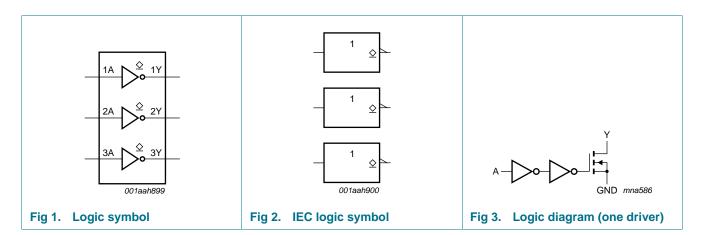
Table 2. Marking codes

Type number	Marking code <sup>[1]</sup>
74LVC3G06DP	V06
74LVC3G06DC	V06
74LVC3G06GT	V06
74LVC3G06GF	V6
74LVC3G06GD	V06
74LVC3G06GM	V06
74LVC3G06GN	V6
74LVC3G06GS	V6

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

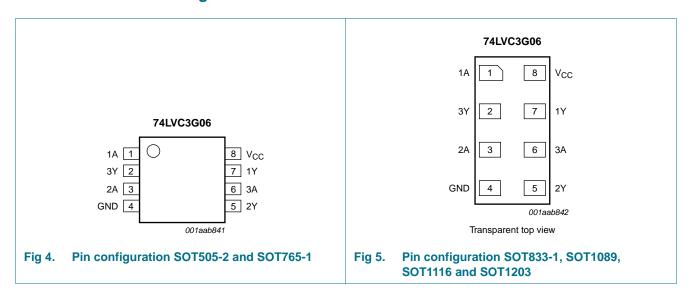
### Triple inverter with open-drain output

### 5. Functional diagram

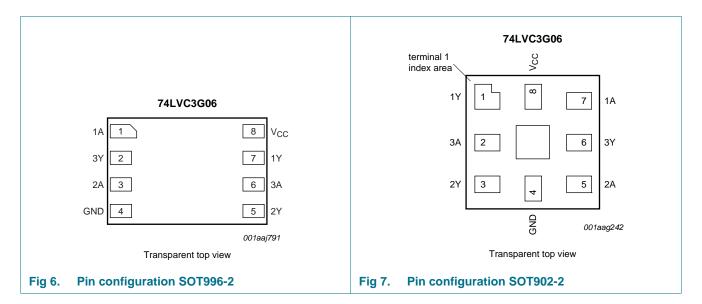


### 6. Pinning information

### 6.1 Pinning



### Triple inverter with open-drain output



### 6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203	SOT902-2	
1A, 2A, 3A	1, 3, 6	7, 5, 2	data input
1Y, 2Y, 3Y	7, 5, 2	1, 3, 6	data output
GND	4	4	ground (0 V)
V <sub>CC</sub>	8	8	supply voltage

### 7. Functional description

Table 4. Function table[1]

Input nA	Output nY
L	Z
Н	L

<sup>[1]</sup> H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

#### Triple inverter with open-drain output

### 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	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
VI	input voltage		[ <u>1</u> ] -0.5	+6.5	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA
Vo	output voltage	Active mode	<u>[1]</u> –0.5	+6.5	V
		Power-down mode	[1][2] -0.5	+6.5	V
Io	output current	$V_O = 0 V \text{ to } 6.5 V$	-	50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$	[3] -	250	mW

<sup>[1]</sup> The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### 9. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	5.5	V
$V_{I}$	input voltage		0	5.5	V
Vo	output voltage	Active mode	0	5.5	V
		Power-down mode; V <sub>CC</sub> = 0 V	0	5.5 V 5.5 V	
T <sub>amb</sub>	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65 \text{ V to } 2.7 \text{ V}$	-	20	ns/V
		V <sub>CC</sub> = 2.7 V to 5.5 V	-	10	ns/V

<sup>[2]</sup> When  $V_{CC} = 0 \text{ V}$  (Power-down mode), the output voltage can be 5.5 V in normal operation.

<sup>[3]</sup> For TSSOP8 and VSSOP8 packages: above 110 °C the value of P<sub>tot</sub> derates linearly at 8.0 mW/K. For XSON8 and XQFN8 packages: above 118 °C the value of P<sub>tot</sub> derates linearly with 7.8 mW/K.

### Triple inverter with open-drain output

### 10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
$T_{amb} = -40$	°C to +85 °C[1]						
V <sub>IH</sub>	HIGH-level input	V <sub>CC</sub> = 1.65 V to 1.95 V		0.65 × V <sub>CC</sub>	-	-	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V		1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V		2.0	-	-	V
		V <sub>CC</sub> = 4.5 V to 5.5 V		$0.7 \times V_{CC}$	-	-	V
V <sub>IL</sub>	LOW-level input	V <sub>CC</sub> = 1.65 V to 1.95 V		-	-	$0.35 \times V_{CC}$	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V		-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V		-	-	8.0	V
		V <sub>CC</sub> = 4.5 V to 5.5 V		-	-	$0.3 \times V_{CC}$	V
V <sub>OL</sub>	LOW-level output	$V_I = V_{IH}$ or $V_{IL}$					
	voltage	$I_O = 100 \ \mu A; \ V_{CC} = 1.65 \ V \ to \ 5.5 \ V$		-	-	0.10	V
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$		-	-	0.45	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$		-	-	0.30	V
		$I_{O} = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$		-	-	0.40	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$		-	-	0.55	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$		-	-	0.55	V
l <sub>l</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	[2]	-	±0.1	±5	μΑ
l <sub>oz</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$		-	±0.1	±10	μΑ
l <sub>OFF</sub>	power-off leakage current	$V_I$ or $V_O = 5.5$ V; $V_{CC} = 0$ V		-	±0.1	±10	μΑ
lcc	supply current	$V_I = 5.5 \text{ V or GND}; I_O = 0 \text{ A};$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$		-	0.1	10	μΑ
Δl <sub>CC</sub>	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$ ; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	[2]	-	5	500	μΑ
Cl	input capacitance			-	2.5	-	pF

### Triple inverter with open-drain output

 Table 7.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T <sub>amb</sub> = -40	°C to +125 °C					
V <sub>IH</sub>	HIGH-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	$0.7 \times V_{CC}$	-	-	V
V <sub>IL</sub>	LOW-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
	voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	8.0	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	$0.3 \times V_{CC}$	V
$V_{OL}$	LOW-level output	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	$I_{O}$ = 100 $\mu$ A; $V_{CC}$ = 1.65 V to 5.5 V	-	-	0.10	V
		$I_{O} = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.70	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	٧
		$I_{O} = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.80	V
I <sub>I</sub>	input leakage current	$V_1 = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	±20	μΑ
l <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±10	μА
l <sub>OFF</sub>	power-off leakage current	$V_I$ or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	-	±20	μА
I <sub>CC</sub>	supply current	$V_I = 5.5 \text{ V or GND; } I_O = 0 \text{ A;}$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	40	μА
Δl <sub>CC</sub>	additional supply current	per pin; $V_1 = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$ ; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	-	5000	μА

<sup>[1]</sup> All typical values are measured at  $T_{amb}$  = 25 °C.

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<sup>[2]</sup> These typical values are measured at  $V_{CC} = 3.3 \text{ V}$ .

### Triple inverter with open-drain output

### 11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Figure 9.

Symbol	Parameter	Conditions		–40 °C to	o +85 °C		-40 °C to	o +125 °C	Unit
				Min	Typ[1]	Max	Min	Max	
$t_{pd}$	propagation delay	nA to nY; see Figure 8	[2]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		1.0	2.6	6.5	1.0	8.2	ns
			$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.5	1.6	3.9	0.5	4.9
		V <sub>CC</sub> = 2.7 V		1.0	2.2	4.2	1.0	5.3	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		0.5	2.0	3.4	0.5	4.3	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		0.5	1.4	2.9	0.5	3.7	ns ns ns
$C_{PD}$	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}$	[3]	-	5.9	-	-	-	pF

<sup>[1]</sup> Typical values are measured at  $T_{amb} = 25$  °C and  $V_{CC} = 1.8$  V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

 $f_i$  = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

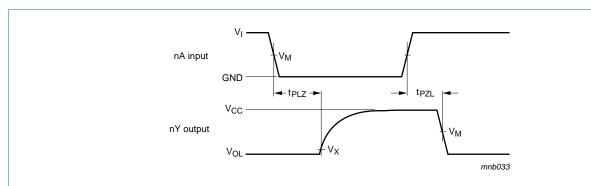
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = 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.

 $\ensuremath{V_{\text{OL}}}$  is the typical output voltage level that occurs with the output load.

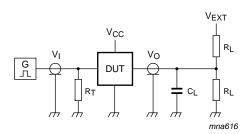
Fig 8. The input (nA) to output (nY) propagation delays

<sup>[2]</sup>  $t_{pd}$  is the same as  $t_{PLZ}$  and  $t_{PZL}$ .

### Triple inverter with open-drain output

Table 9. Measurement points

Supply voltage	Input	Output	
V <sub>CC</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V <sub>OL</sub> + 0.15 V
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V <sub>OL</sub> + 0.15 V
2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V
4.5 V to 5.5 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V <sub>OL</sub> + 0.3 V



Test data is given in Table 10.

Definitions for test circuit:

R<sub>L</sub> = Load resistance.

 $C_L$  = Load capacitance including jig and probe capacitance.

 $R_T$  = Termination resistance should be equal to the output impedance  $Z_0$  of the pulse generator.

 $V_{EXT}$  = External voltage for measuring switching times.

Fig 9. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V <sub>EXT</sub>
V <sub>CC</sub>	V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	CL	R <sub>L</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>
1.65 V to 1.95 V	V <sub>CC</sub>	$\leq$ 2.0 ns	30 pF	1 kΩ	$2 \times V_{CC}$
2.3 V to 2.7 V	$V_{CC}$	≤ 2.0 ns	30 pF	500 Ω	2 × V <sub>CC</sub>
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V
4.5 V to 5.5 V	$V_{CC}$	≤ 2.5 ns	50 pF	$500~\Omega$	2 × V <sub>CC</sub>

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### 13. Package outline

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

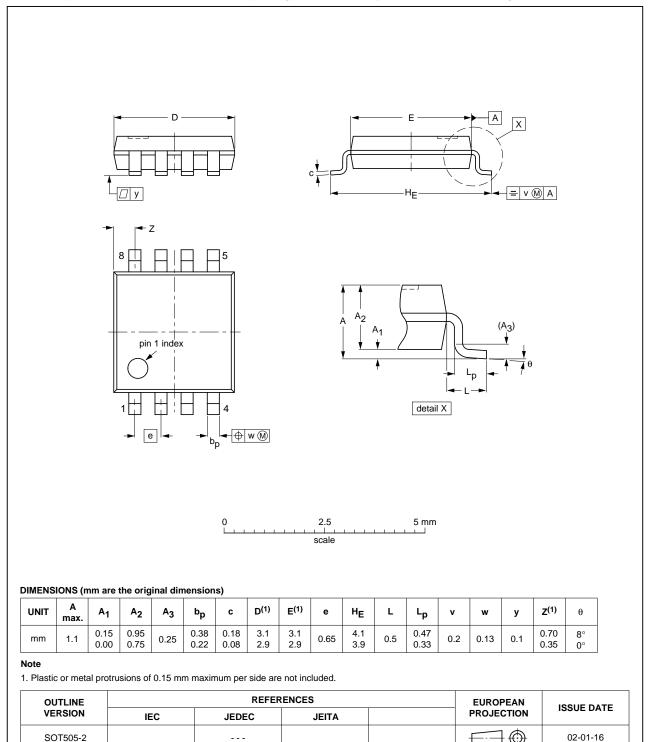
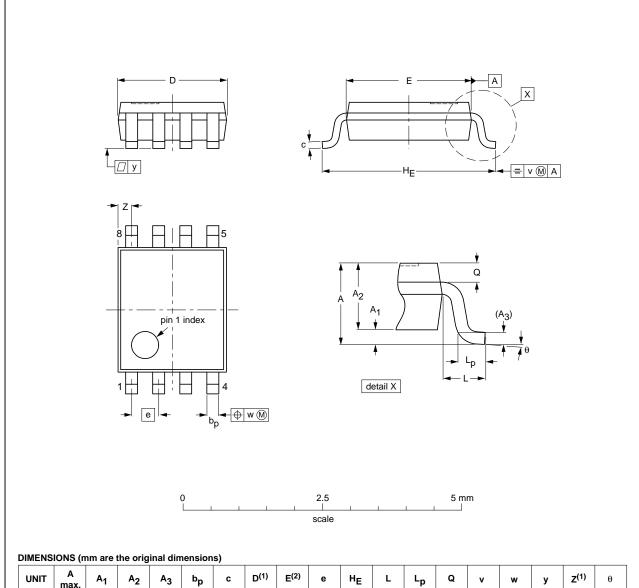


Fig 10. Package outline SOT505-2 (TSSOP8)

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

SOT765-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	А3	bp	С	D <sup>(1)</sup>	E <sup>(2)</sup>	е	HE	L	Lp	Q	v	w	у	Z <sup>(1)</sup>	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.
- 2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

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

Fig 11. Package outline SOT765-1 (VSSOP8)

74LVC3G06

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74LVC3G06

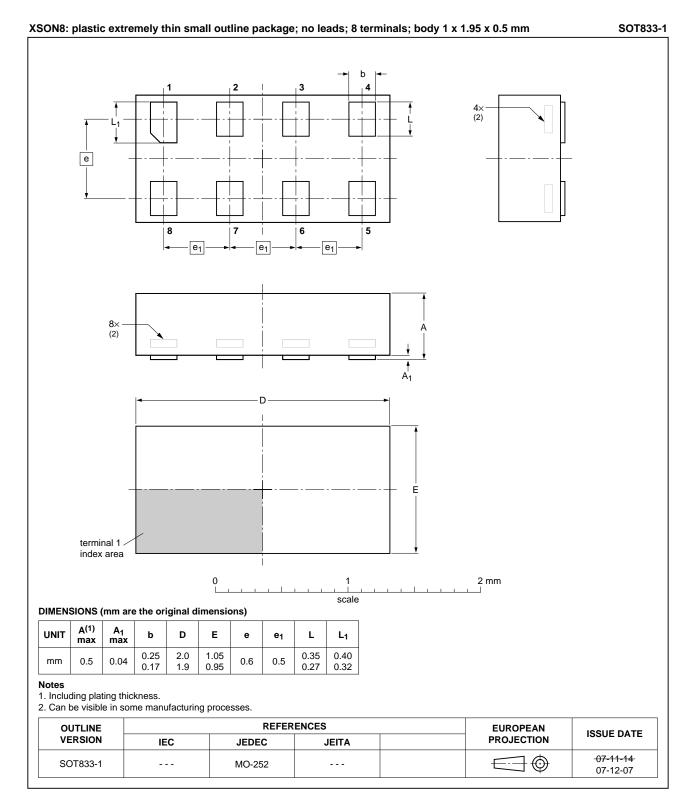


Fig 12. Package outline SOT833-1 (XSON8)

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### Triple inverter with open-drain output

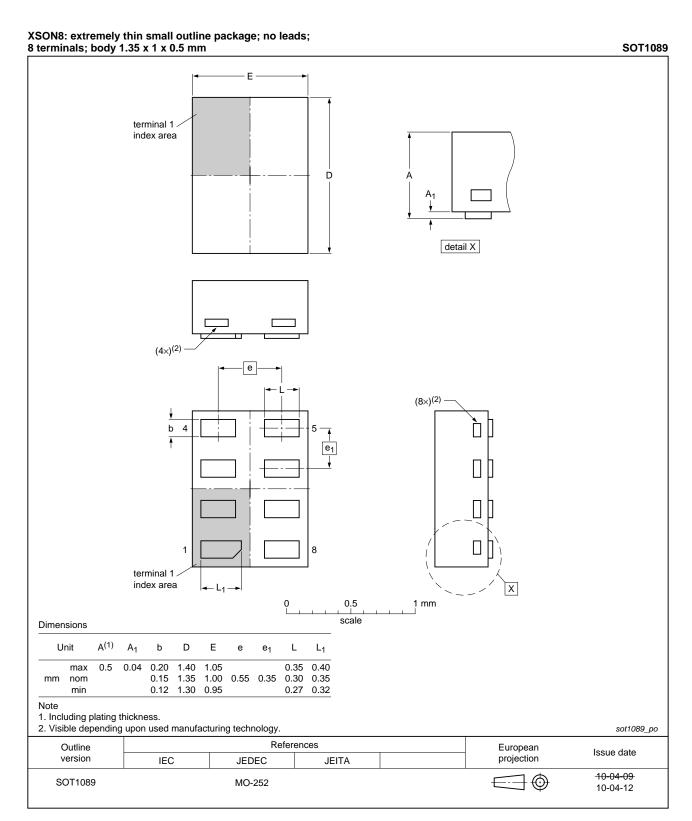


Fig 13. Package outline SOT1089 (XSON8)

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Triple inverter with open-drain output

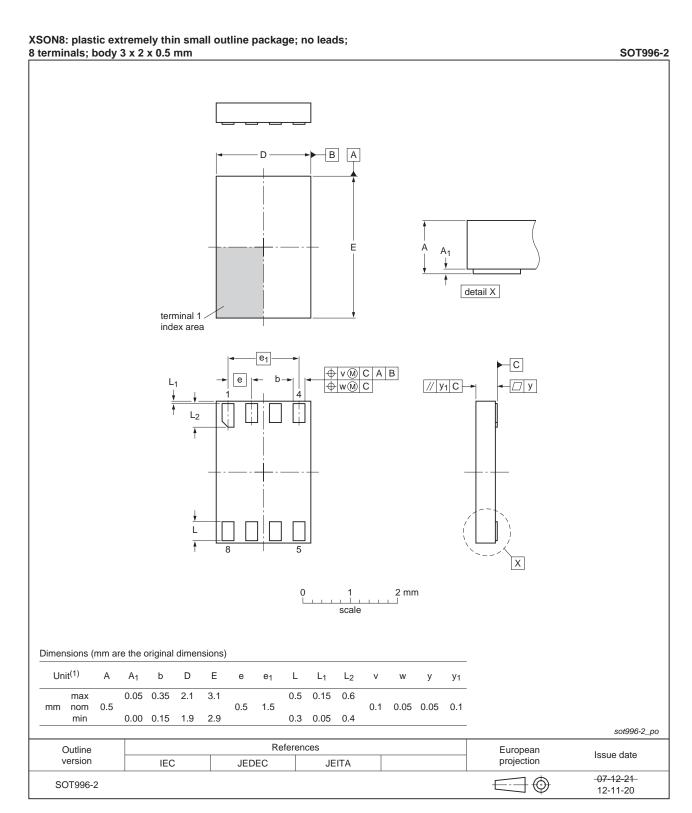


Fig 14. Package outline SOT996-2 (XSON8)

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Triple inverter with open-drain output

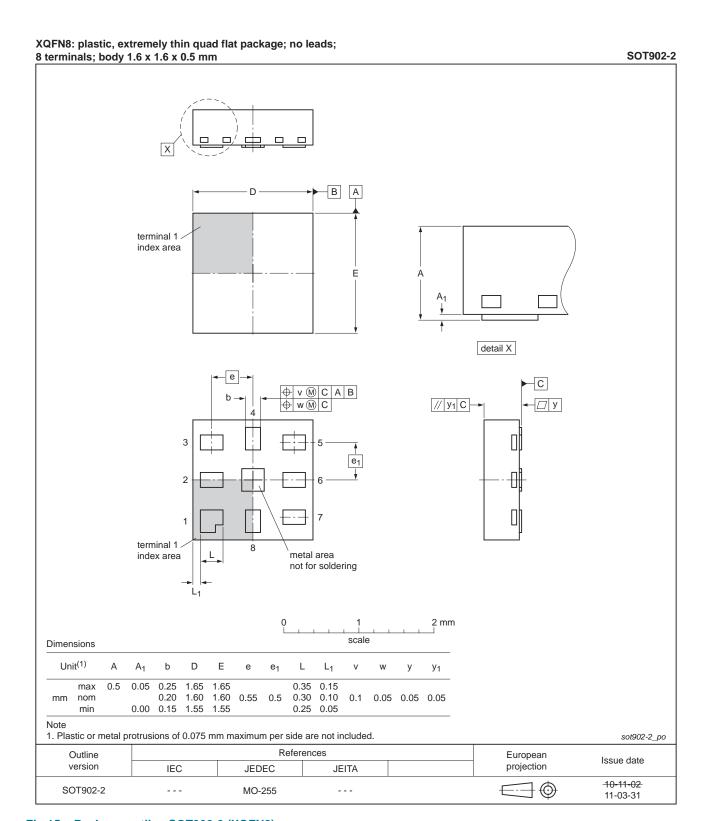


Fig 15. Package outline SOT902-2 (XQFN8)

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Triple inverter with open-drain output

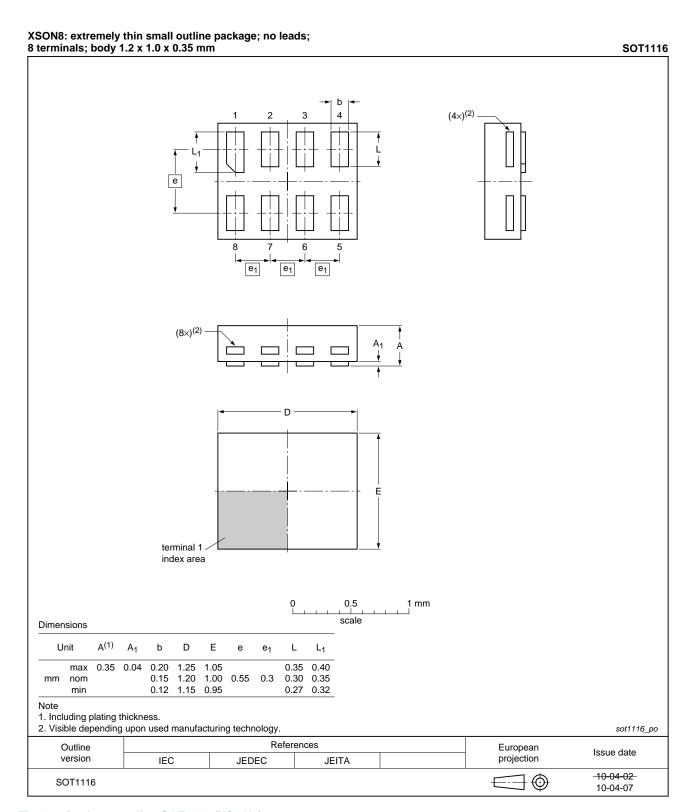


Fig 16. Package outline SOT1116 (XSON8)

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### Triple inverter with open-drain output

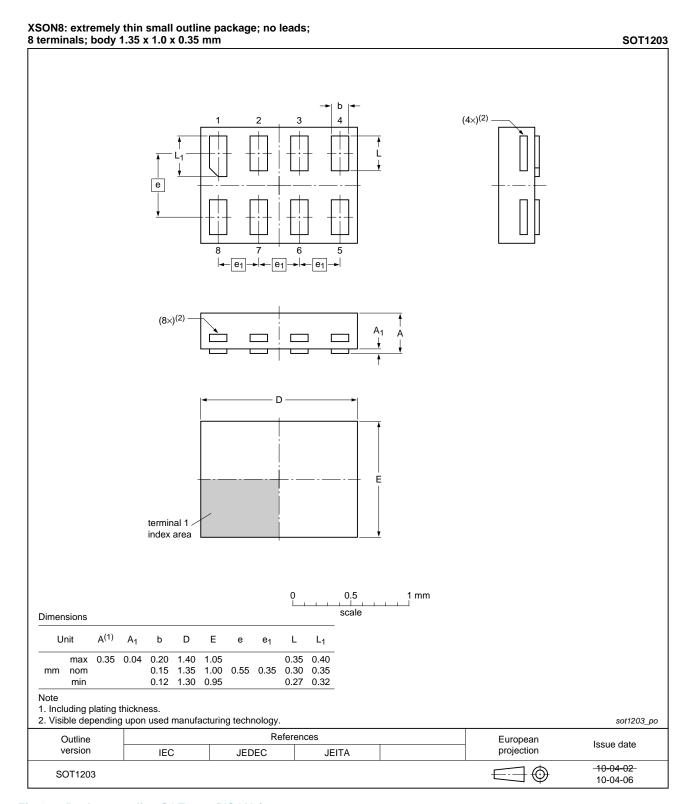


Fig 17. Package outline SOT1203 (XSON8)

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### Triple inverter with open-drain output

### 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
74LVC3G06 v.11	20130328	Product data sheet	-	74LVC3G06 v.10
Modifications:	<ul> <li>For type nu</li> </ul>	mber 74LVC3G06GD XS0	N8U has changed to XS	ON8.
74LVC3G06 v.10	20120627	Product data sheet	-	74LVC3G06 v.9
Modifications:	<ul> <li>For type nu</li> </ul>	mber 74LVC3G06GM the	SOT code has changed	to SOT902-2.
74LVC3G06 v.9	20111123	Product data sheet	-	74LVC3G06 v.8
Modifications:	<ul> <li>Legal pages</li> </ul>	s updated.		
74LVC3G06 v.8	20100809	Product data sheet	-	74LVC3G06 v.7
74LVC3G06 v.7	20090312	Product data sheet	-	74LVC3G06 v.6
74LVC3G06 v.6	20080403	Product data sheet	-	74LVC3G06 v.5
74LVC3G06 v.5	20070521	Product data sheet	-	74LVC3G06 v.4
74LVC3G06 v.4	20060302	Product data sheet	-	74LVC3G06 v.3
74LVC3G06 v.3	20050201	Product data sheet	-	74LVC3G06 v.2
74LVC3G06 v.2	20041021	Product data sheet	-	74LVC3G06 v.1
74LVC3G06 v.1	20040607	Product data sheet	-	-

#### Triple inverter with open-drain output

### 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.

- [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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#### Triple inverter with open-drain output

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### Triple inverter with open-drain output

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