74LVC1G06

Inverter with open-drain output Rev. 12 — 22 May 2018

Product data sheet

General description

The 74LVC1G06 provides the inverting buffer.

Input can be driven from either 3.3 V or 5 V devices. These features allow the use of these devices 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_{OFF}. The I_{OFF} circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

The output of the 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.

Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- · 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)
 - JESD8B/JESD36 (2.7 V to 3.6 V)
- ±24 mA output drive (V_{CC} = 3.0 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
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Specified from -40 °C to +125 °C



3 Ordering information

Table 1. Ordering information

Type number	Package	Package						
	Temperature range	Name	Description	Version				
74LVC1G06GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74LVC1G06GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74LVC1G06GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886				
74LVC1G06GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891				
74LVC1G06GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115				
74LVC1G06GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202				
74LVC1G06GX	-40 °C to +125 °C	X2SON5	plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.35 mm	SOT1226				

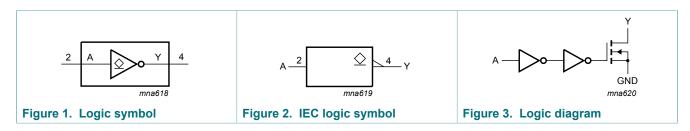
4 Marking

Table 2. Marking codes

Type number	Marking ^[1]
74LVC1G06GW	VR
74LVC1G06GV	V06
74LVC1G06GM	VR
74LVC1G06GF	VR
74LVC1G06GN	VR
74LVC1G06GS	VR
74LVC1G06GX	VR

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

5 Functional diagram

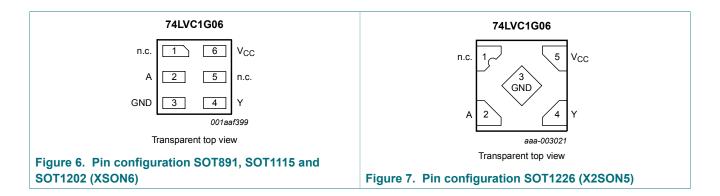


Inverter with open-drain output

6 Pinning information

6.1 Pinning





6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	TSSOP5 and X2SON5	XSON6	
n.c.	1	1	not connected
A	2	2	data input
GND	3	3	ground (0 V)
Υ	4	4	data output
n.c.	-	5	not connected
V _{CC}	5	6	supply voltage

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7 Functional description

Table 4. Function table

Input [1]	Output
A	Υ
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	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
V _I	input voltage	[1	-0.5	+6.5	V
I _{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0 V$	-	±50	mA
V _O	output voltage	Active mode and Power-down mode [1	-0.5	+6.5	V
I _{O(sink/source)}	output sink or source current	$V_O = 0 V \text{ to } V_{CC}$	-	±50	mA
I _{CC}	supply current		-	+100	mA
I _{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	_	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).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	5.5	V
		Power-down mode; V _{CC} = 0 V	0	-	5.5	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
		V _{CC} = 2.7 V to 5.5 V	-	-	10	ns/V

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^[2] For TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 and X2SON5 package: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

10 Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ ^[1]	Max	Min	Max	
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	0.65V _{CC}	-	V
	voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7V _{CC}	-	-	0.7V _{CC}	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	0.35V _{CC}	-	0.35V _{CC}	V
	voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3V _{CC}	-	0.3V _{CC}	V
V _{OL}	LOW-level output	$V_I = V_{IH}$ or V_{IL}						
	voltage	$I_O = 100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	0.10	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.30	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.40	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.80	V
II	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	μA
I _{OZ}	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	±2	-	±2	μA
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±0.1	±2	-	±2	μA
I _{CC}	supply current	V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V	-	0.1	4	-	4	μΑ
ΔI _{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V to } 5.5 \text{ V}; \text{ per pin}$	-	5	500	-	5 00	μΑ
Cı	input capacitance	V_{CC} = 3.3 V; V_I = GND to V_{CC}	-	5	-	-	-	pF

^[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 $^{\circ}C.$

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 +85 °C			-40 °C to	+125 °C	Unit
			Min	Typ ^[1]	Max	Min	Max	
t _{pd}	propagation delay	A to Y; see Figure 8 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	3	6.5	1.0	8.5	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	1.9	4	0.5	5.5	ns
		V _{CC} = 2.7 V	0.5	2.5	4.5	0.5	6	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.3	4	0.5	5.5	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	1.7	3	0.5	4	ns
C _{PD}	power dissipation capacitance	$V_{I} = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}^{[3]}$	-	14	-	-	-	pF

^[1] 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.

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

 f_i = input frequency in MHz;

 f_o = output frequency in MHz;

C_L = output load capacitance in pF;

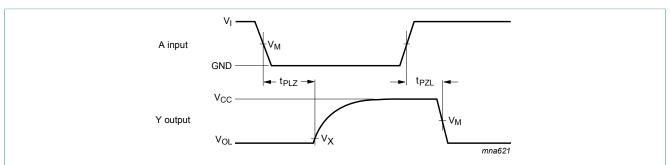
V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs.}$

 ¹⁷ Typical values are measured at Tamb = 25° C and V_{CC} = 1.8 V, 2.8 V.
 [2] t_{pd} is the same as t_{PLZ} and t_{PZL}.
 [3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

11.1 Waveforms and test circuit



Measurement points are given in <u>Table 9</u>.

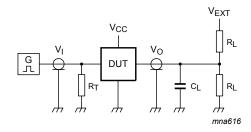
 $\ensuremath{V_{\text{OL}}}$ is the typical output voltage level that occurs with the output load.

Figure 8. The input A to output Y propagation delay times

Table 9. Measurement points

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	
1.65 V to 1.95 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.15 V	
2.3 V to 2.7 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.15 V	
2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	
3.0 V to 3.6 V	1.5 V	1.5 V	V _{OL} + 0.3 V	
4.5 V to 5.5 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	

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Test data is given in Table 10.

Definitions test circuit:

R_L = Load resistance.

 C_L = Load capacitance including jig and probe capacitance.

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

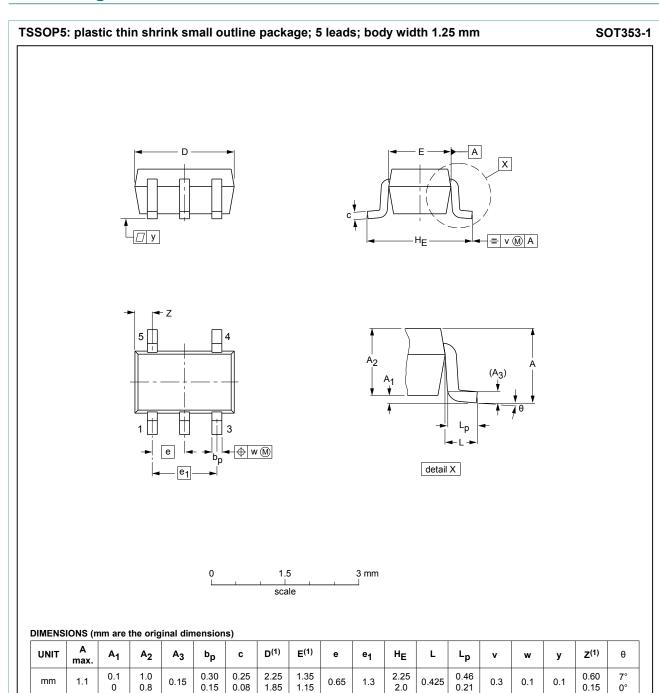
 V_{EXT} = External voltage for measuring switching times.

Figure 9. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load	V _{EXT}	
V _{CC}	VI	$t_r = t_f$	CL	R _L	t _{PZL} , t _{PLZ}
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	2V _{CC}
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	2V _{CC}
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 Ω	2V _{CC}

12 Package outline



Note

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

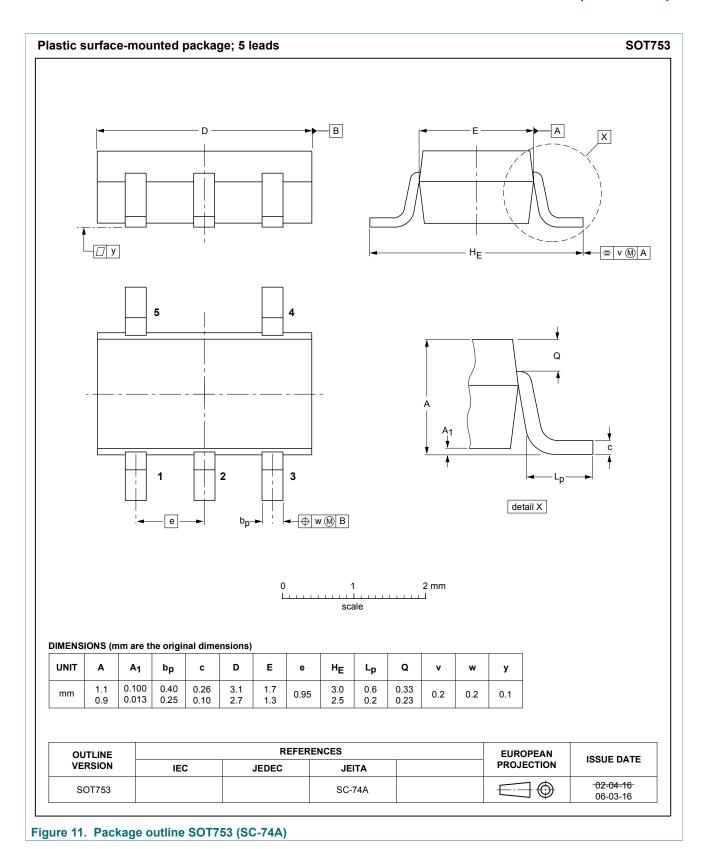
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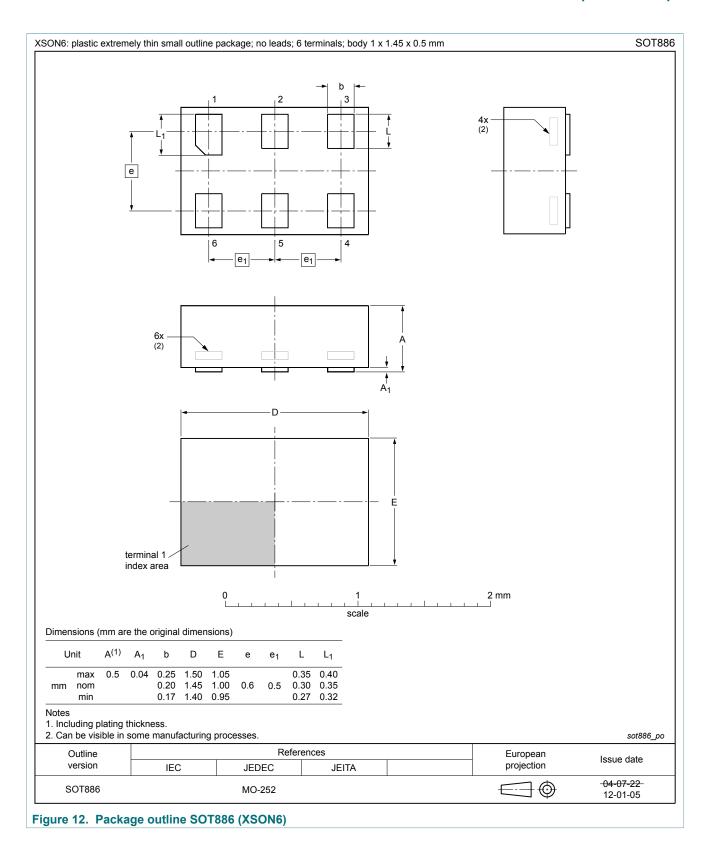
Figure 10. Package outline SOT353-1 (TSSOP5)

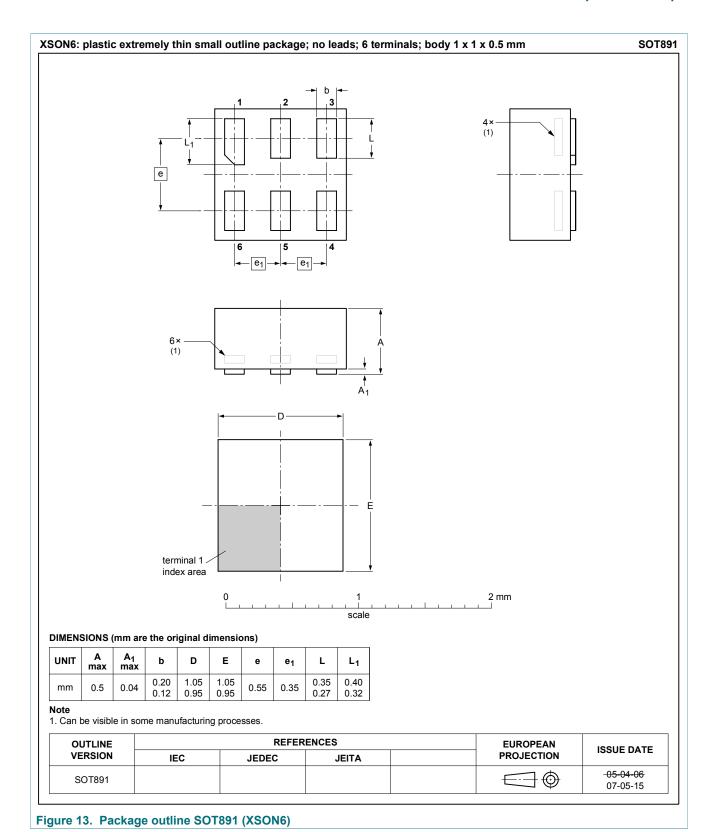
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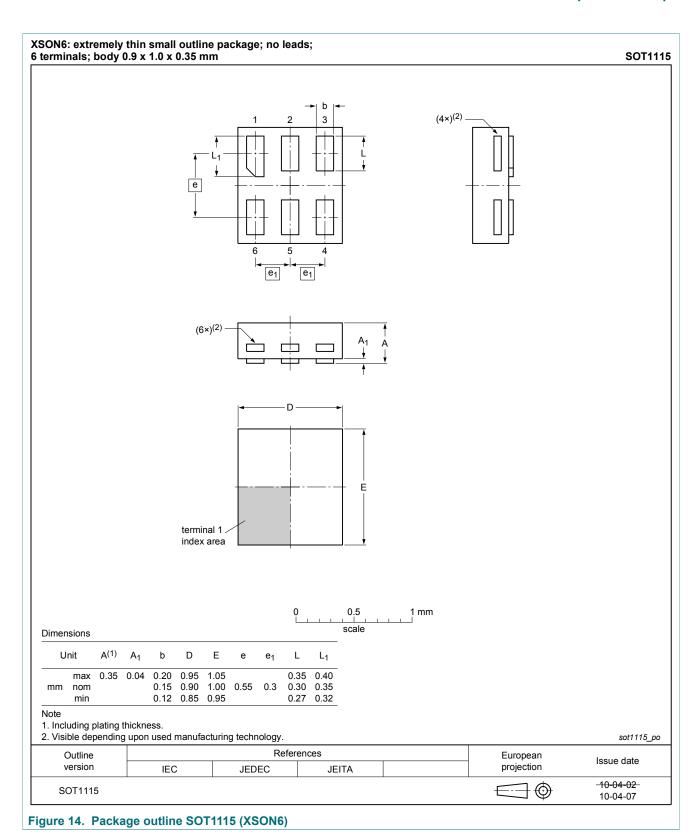
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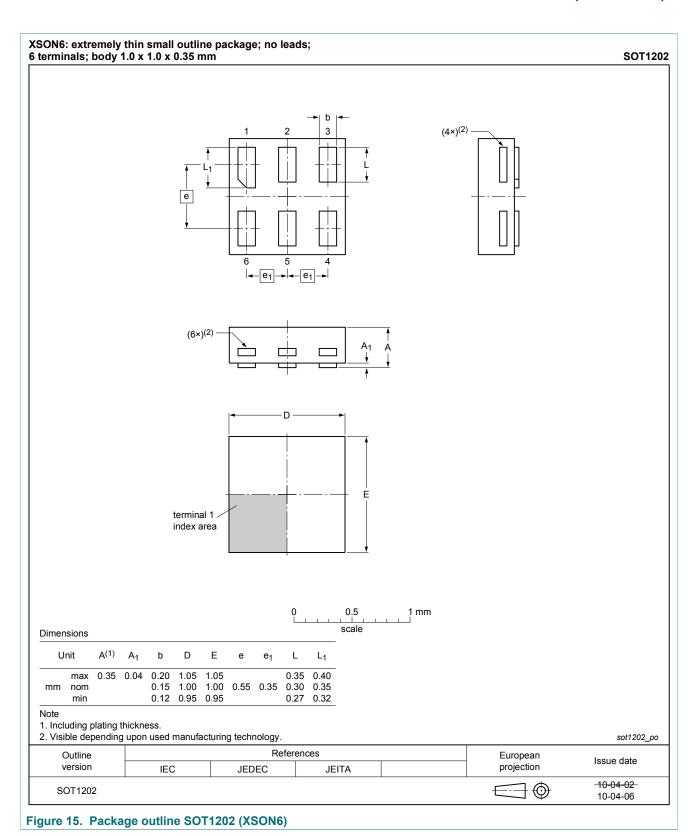


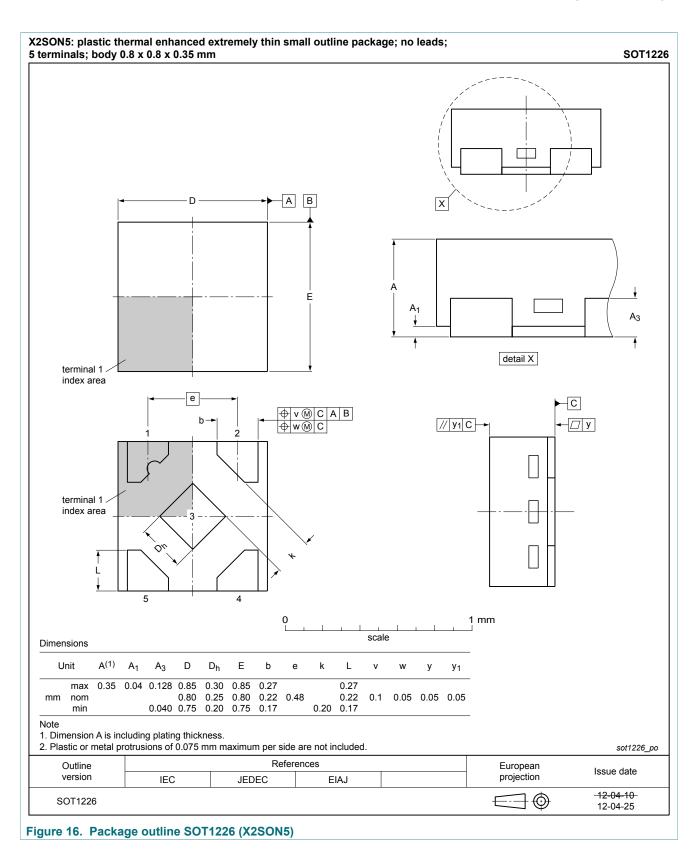


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13 Abbreviations

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

14 Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74LVC1G06 v.12	20180522	Product data sheet	-	74LVC1G06 v.11	
Modifications:	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. 				
74LVC1G06 v.11	20161128	Product data sheet	-	74LVC1G06 v.10	
Modifications:	 <u>Table 7</u>: The maximum limits for leakage current and supply current have changed. <u>Table 7</u>: OFF-state output current parameter added. 				
74LVC1G06 v.10	20120629	Product data sheet	-	74LVC1G06 v.9	
Modifications:	 Added type number 74LVC1G06GX (SOT1226) Package outline drawing of SOT886 (Figure 12) modified. 				
74LVC1G06 v.9	20111207	Product data sheet	-	74LVC1G06 v.8	
Modifications:	Legal pages updated.				
74LVC1G06 v.8	20101026	Product data sheet	-	74LVC1G06 v.7	
74LVC1G06 v.7	20070712	Product data sheet	-	74LVC1G06 v.6	
74LVC1G06 v.6	20060912	Product data sheet	-	74LVC1G06 v.5	
74LVC1G06 v.5	20040907	Product specification	-	74LVC1G06 v.4	
74LVC1G06 v.4	20030303	Product specification	-	74LVC1G06 v.3	
74LVC1G06 v.3	20020529	Product specification	-	74LVC1G06 v.2	
74LVC1G06 v.2	20010405	Product specification	-	74LVC1G06 v.1	
74LVC1G06 v.1	20001121	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.
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Product [short] data sheet	Production	This document contains the product specification.

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Inverter with open-drain output

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