74LVC2G06

Inverters with open-drain outputs

Rev. 10 — 15 August 2023

Product data sheet

1. General description

The 74LVC2G06 is a dual inverter with open-drain outputs. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments. Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times. This device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- -24 mA output drive (V_{CC} = 3.0 V)
- · CMOS low power consumption
- Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- · Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- · Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C



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3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G06GW	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2
74LVC2G06GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457
74LVC2G06GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC2G06GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	<u>SOT1115</u>
74LVC2G06GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	<u>SOT1202</u>
74LVC2G06GX	-40 °C to +125 °C	X2SON6	plastic thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.0 × 0.8 × 0.32 mm	SOT1255-2

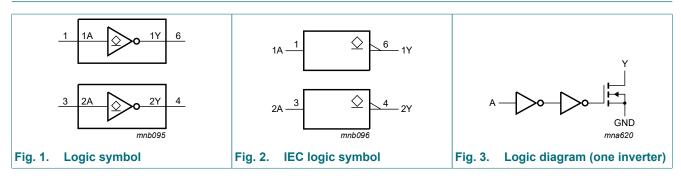
4. Marking

Table 2. Marking

Type number	Marking code[1]
74LVC2G06GW	V6
74LVC2G06GV	V06
74LVC2G06GM	V6
74LVC2G06GN	V6
74LVC2G06GS	V6
74LVC2G06GX	V6

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

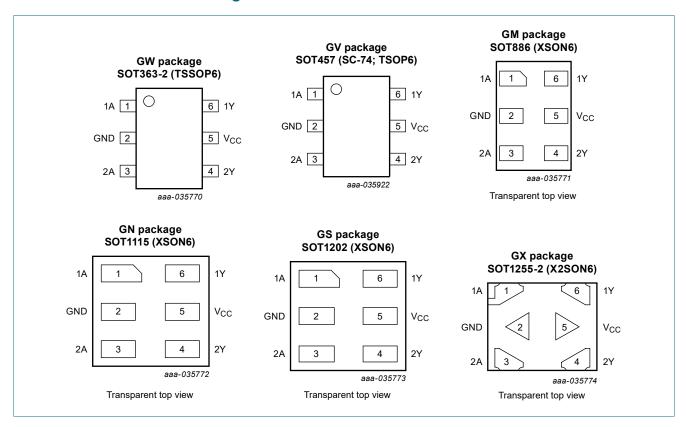
5. Functional diagram



Inverters with open-drain outputs

6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Table 5.1 III description			
Symbol	Pin	Description	
1A	1	data input	
GND	2	ground (0 V)	
2A	3	data input	
2Y	4	data output	
V _{CC}	5	supply voltage	
1Y	6	data output	

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

Input nA	Output nY
L	Z
Н	L

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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
VI	input voltage		[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O < 0 V		-50	-	mA
Vo	output voltage	Active mode	[1]	-0.5	+6.5	V
		Power-down mode; V _{CC} = 0 V	[1]	-0.5	+6.5	V
Io	output current	V _O = 0 V to 6.5 V		-	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 °C to +125 °C	[2]	-	250	mW

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

For SOT457 (SC-74; TSOP6) package: Ptot derates linearly with 4.1 mW/K above 89 °C.

For SOT886 (XSON6) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

For SOT1115 (XSON6) package: P_{tot} derates linearly with 3.2 mW/K above 71 °C.

For SOT1202 (XSON6) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

For SOT1255-2 (X2SON6) package: Ptot derates linearly with 3.3 mW/K above 75 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	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 _{CC} = 0 V	0	-	5.5	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and	V _{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
	fall rate	V _{CC} = 2.7 V to 5.5 V	-	-	10	ns/V

^[2] For SOT363-2 (TSSOP6) package: Ptot derates linearly with 3.7 mW/K above 83 °C.

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10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} = -4	40 °C to +85 °C					
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V	
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}				
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	V
l _l	input leakage current	$V_1 = 5.5 \text{ V or GND}; V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	[2] -	±0.1	±1	μΑ
l _{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	μΑ
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	±0.1	±2	μΑ
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	μΑ
ΔI _{CC}	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
Cı	input capacitance		-	2.5	-	pF

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} = -4	40 °C to +125 °C		'			
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
	V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V	
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V	
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OL} LOW-level	$V_I = V_{IH}$ or V_{IL}					
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.80	V
I _I	input leakage current	$V_1 = 5.5 \text{ V or GND}; V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	±1	μΑ
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±2	μΑ
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	-	±2	μΑ
I _{CC}	supply current	V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V	-	-	4	μΑ
Δl _{CC}	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	-	-	500	μΑ

^[1] All typical values are measured at T_{amb} = 25 °C. [2] These typical values are measured at V_{CC} = 3.3 V.

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11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2						
		V _{CC} = 1.65 V to 1.95 V	1.0	3.2	6.5	1.0	8.2	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	2.0	3.9	0.5	4.9	ns
		V _{CC} = 2.7 V	1.0	2.6	4.2	1.0	5.3	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.3	3.4	0.5	4.3	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	1.6	2.9	0.5	3.7	ns
C _{PD}	power dissipation capacitance	$V_1 = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}$ [3	-	5.9	-	-	-	pF

- 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.
- t_{pd} is the same as t_{PLZ} and t_{PZL} . C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

 f_o = output frequency in MHz;

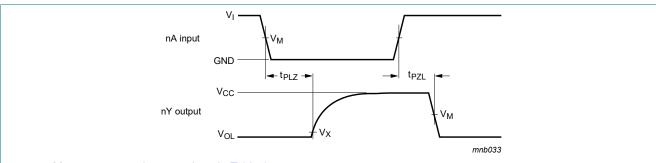
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveform and test circuit



Measurement points are given in Table 9.

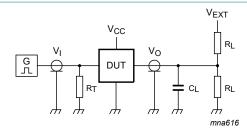
V_{OL} is the typical output voltage level that occur with the output load.

The input (nA) to output (nY) propagation delays

Table 9. Measurement points

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × V _{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	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.3 V	

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Test data is given in Table 10.

Definitions for test circuit:

R_L = Load resistance;

 C_L = Load capacitance including jig and probe capacitance;

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

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

Fig. 5. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V _{EXT}
V _{CC}	V _I	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	2 × V _{CC}
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	2 × V _{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	2 × V _{CC}

Inverters with open-drain outputs

12. Package outline

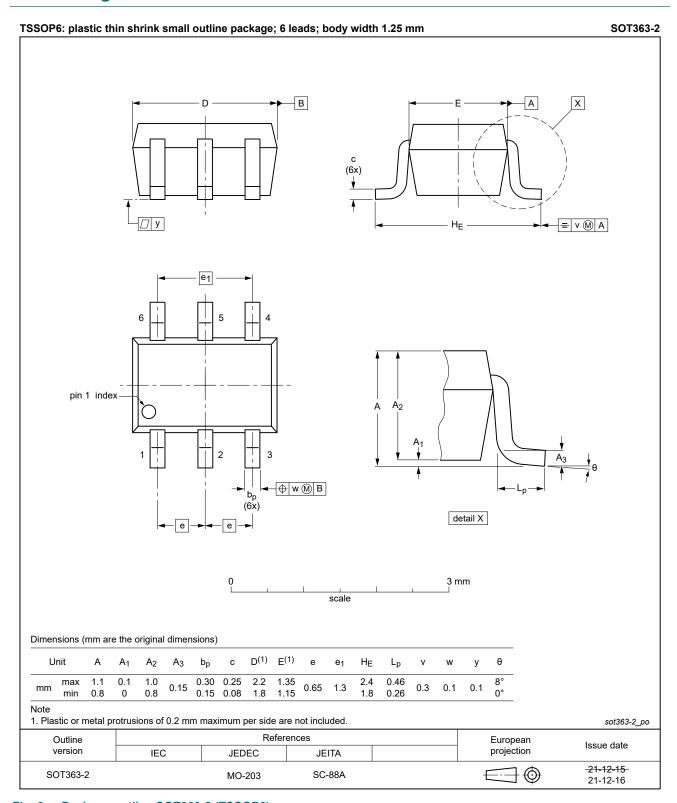


Fig. 6. Package outline SOT363-2 (TSSOP6)

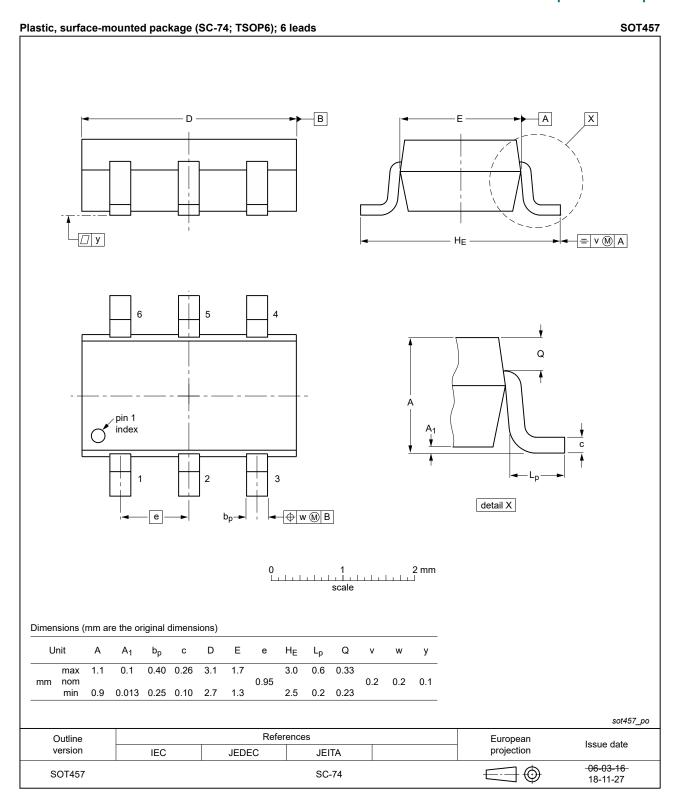


Fig. 7. Package outline SOT457 (SC-74; TSOP6)

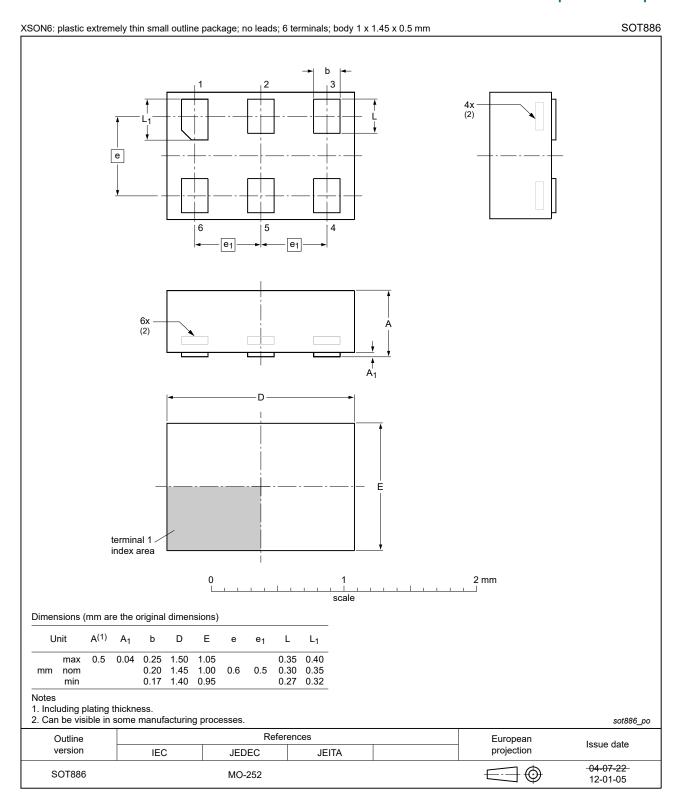


Fig. 8. Package outline SOT886 (XSON6)

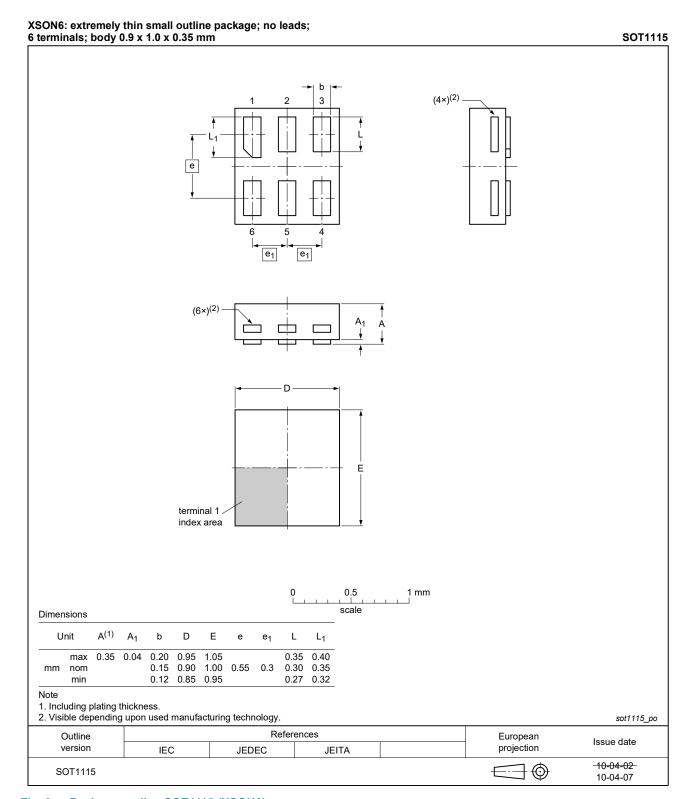


Fig. 9. Package outline SOT1115 (XSON6)

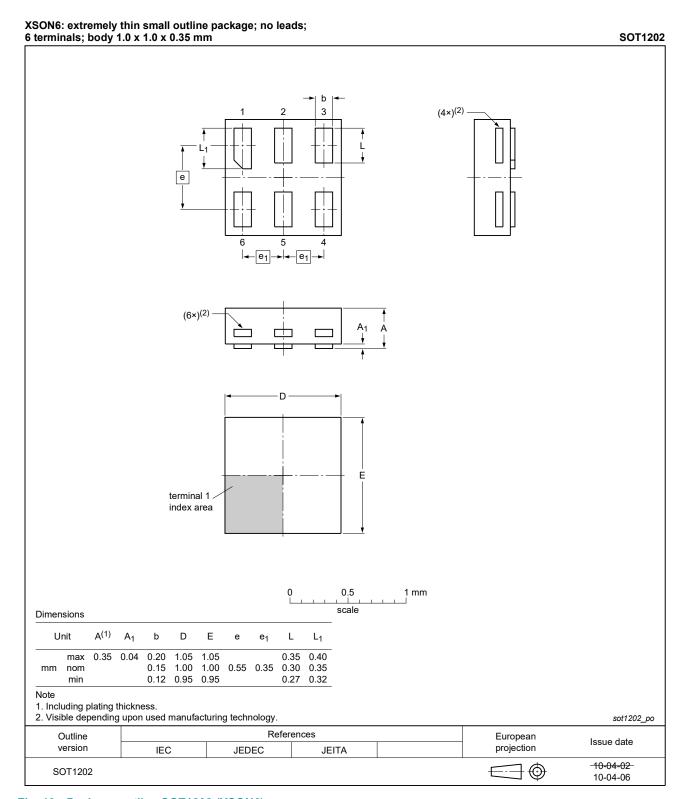


Fig. 10. Package outline SOT1202 (XSON6)

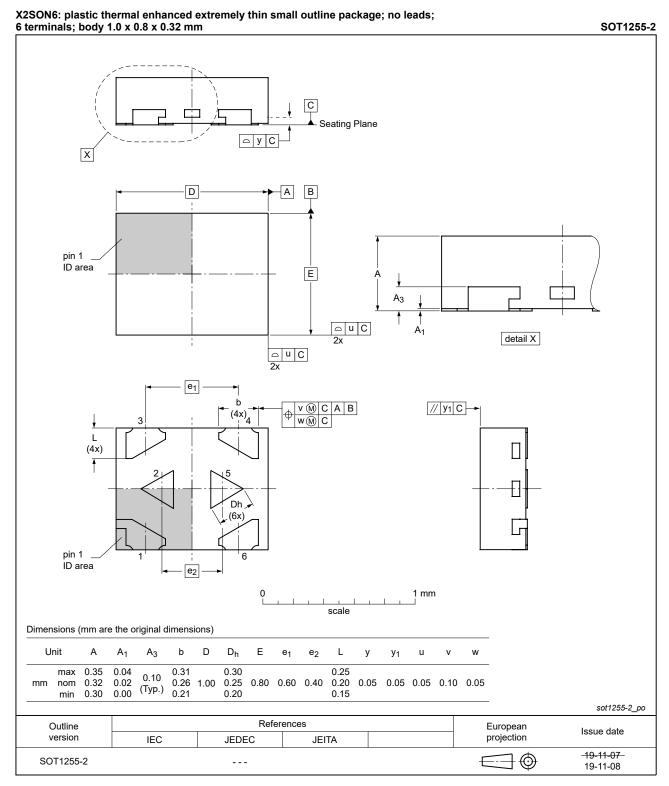


Fig. 11. Package outline SOT1255-2 (X2SON6)

Inverters with open-drain outputs

13. Abbreviations

Table 11. Abbreviations

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

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC2G06 v.10	20230815	Product data sheet	-	74LVC2G06 v.9		
Modifications:	<u>Section 2</u> : E	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LVC2G06 v.9	20220124	Product data sheet	-	74LVC2G06 v.8		
Modifications:	Package S0Package S0<u>Fig. 7</u>: PackType number	 <u>Section 1</u> updated. Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6). Package SOT1255 (X2SON6) changed to SOT1255-2 (X2SON6). <u>Fig. 7</u>: Package outline drawing for SOT457 (SC-74; TSOP6) has changed. Type number 74LVC2G06GF (SOT891/XSON6) removed. <u>Table 5</u>: Derating values for P_{tot} total power dissipation updated. 				
74LVC2G06 v.8	20161212	Product data sheet	-	74LVC2G06 v.7		
Modifications:	• <u>Table 7</u> : The	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC2G06 v.7	20150917	Product data sheet	-	74LVC2G06 v.6		
Modifications:	Added type	Added type number 74LVC2G06GX (SOT1255/X2SON6).				
74LVC2G06 v.6	20120704	Product data sheet	-	74LVC2G06 v.5		
Modifications:	• Package ou	Package outline drawing of SOT886 (Fig. 8) modified.				
74LVC2G06 v.5	20111130	Product data sheet	-	74LVC2G06 v.4		
Modifications:	Legal pages	Legal pages updated.				
74LVC2G06 v.4	20101028	Product data sheet	-	74LVC2G06 v.3		
74LVC2G06 v.3	20070521	Product data sheet	-	74LVC2G06 v.2		
74LVC2G06 v.2	20040910	Product specification	-	74LVC2G06 v.1		
74LVC2G06 v.1	20030825	Product specification	-	-		

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15. Legal information

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.

- 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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Inverters with open-drain outputs

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