74LVC1G06

Inverter with open-drain output

Rev. 13 — 24 September 2021

Product data sheet

1. General description

The 74LVC1G06 is a single inverter with open-drain output. 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
- · 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)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- ±24 mA output drive (V_{CC} = 3.0 V)
- CMOS low power dissipation
- · Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- I_{OFF} circuitry provides partial Power-down mode operation
- 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



Inverter with open-drain output

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						
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 × 0.32 mm	SOT1226-3						

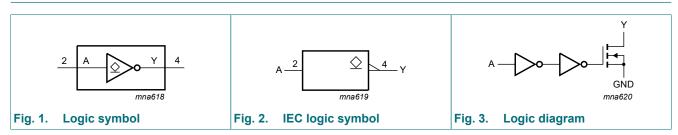
4. Marking

Table 2. Marking codes

Type number	Marking [1]
74LVC1G06GW	VR
74LVC1G06GV	V06
74LVC1G06GM	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.

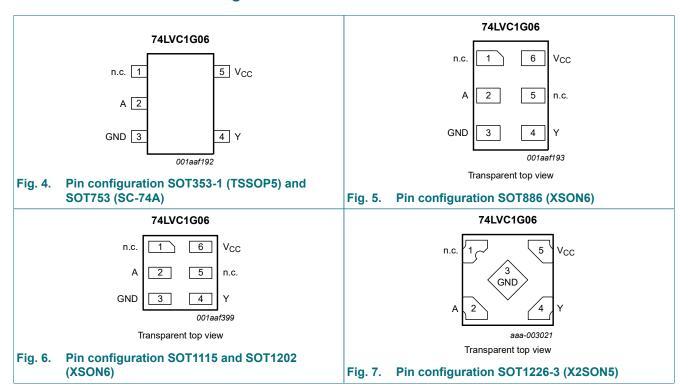
5. Functional diagram



Inverter with open-drain output

6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Pin					
	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				

7. Functional description

Table 4. Function table

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

Input	Output
A	Υ
L	Z
Н	L

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 _{IK}	input clamping current	V _I < 0 V	-50	-	mA
VI	input voltage	[1	-0.5	+6.5	V
l _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V	-	±50	mA
Vo	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 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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	250	mW

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

For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

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

For SOT1115 (XSON6) package: P $_{\rm tot}$ derates linearly with 3.2 mW/K above 71 $^{\circ}\text{C}.$

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

For SOT1226-3 (X2SON5) package: Ptot derates linearly with 3.0 mW/K above 67 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	rameter Conditions				Unit
V _{CC}	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
V _O output voltage	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

^[2] For SOT353-1 (TSSOP5) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

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	-40	°C to +8	5 °C	-40 °C to	Unit	
			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	-	8.0	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	μΑ
I _{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	±0.1	±2	-	±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	-	±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	-	4	μΑ
Δl _{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}; \text{ per pin}$	-	5	500	-	500	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 °C.

Inverter with open-drain output

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9.

Symbol	Parameter	Conditions	-40	°C to +8	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	A to Y; see <u>Fig. 8</u> [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.
- 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).

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

f_i = input frequency in MHz;

 f_o = output frequency in MHz;

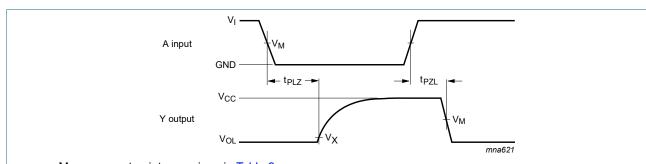
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

11.1. Waveforms and test circuit



Measurement points are given in Table 9.

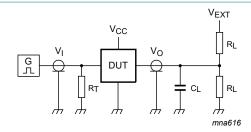
V_{OL} is the typical output voltage level that occurs with the output load.

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		

Inverter with open-drain output



Test data is given in Table 10.

Definitions test circuit:

 R_L = Load resistance.

 $\ensuremath{C_L}$ = 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.

Fig. 9. Test circuit for measuring switching times

Table 10. Test data

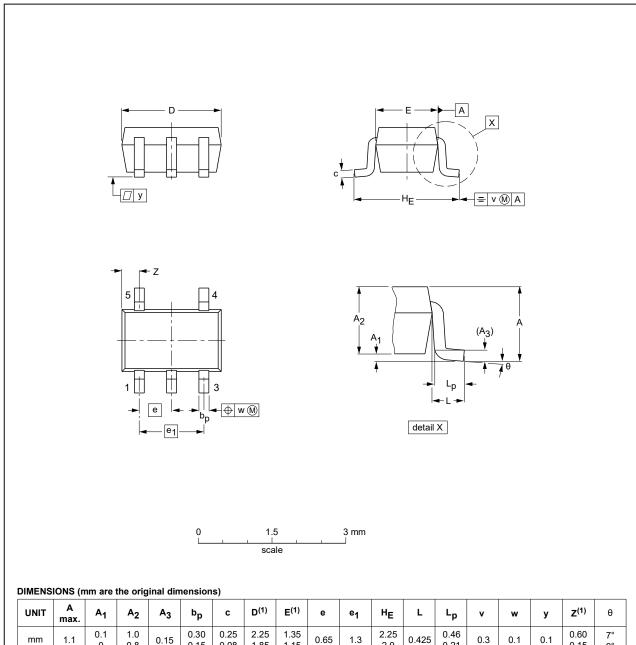
Supply voltage	Input		Load	V _{EXT}		
V _{CC}	V_1 $t_r = t_f$		CL	R _L	t _{PZL} , t _{PLZ}	
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	2V _{CC}	
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	2V _{CC}	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V	
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	2V _{CC}	

Inverter with open-drain output

12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	C	D ⁽¹⁾	E ⁽¹⁾	е	e ₁	HE	L	Lp	٧	w	у	Z ⁽¹⁾	θ	
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°	

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

OUTLINE	DUTLINE REFERENCES				EUROPEAN	ISSUE DATE	
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT353-1		MO-203	SC-88A			00-09-01 03-02-19	

Fig. 10. Package outline SOT353-1 (TSSOP5)

Inverter with open-drain output

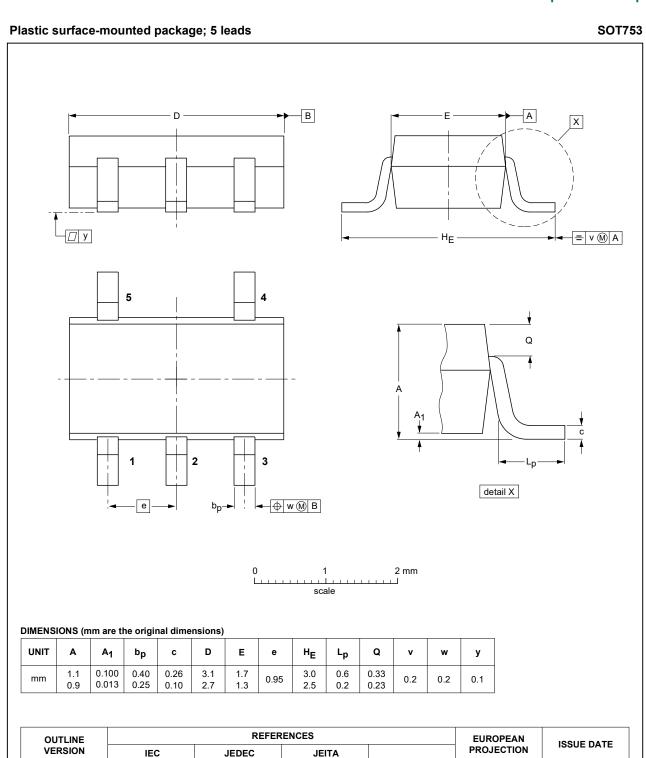


Fig. 11. Package outline SOT753 (SC-74A)

SOT753

SC-74A

02-04-16

06-03-16

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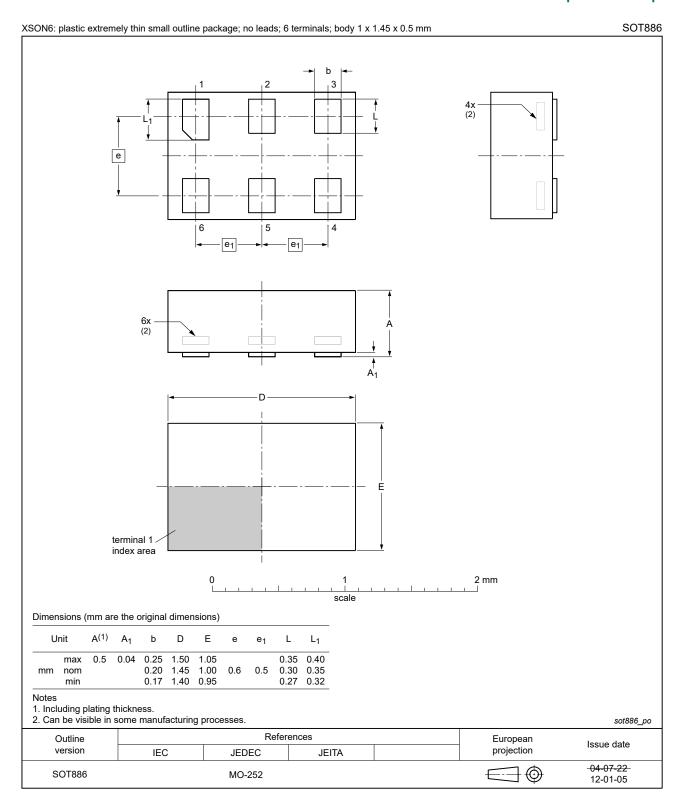


Fig. 12. Package outline SOT886 (XSON6)

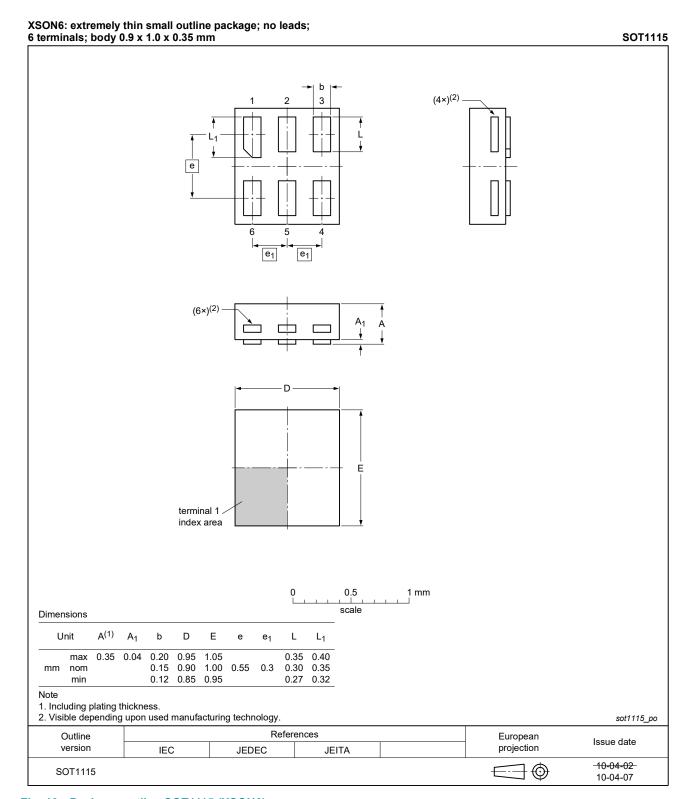


Fig. 13. Package outline SOT1115 (XSON6)

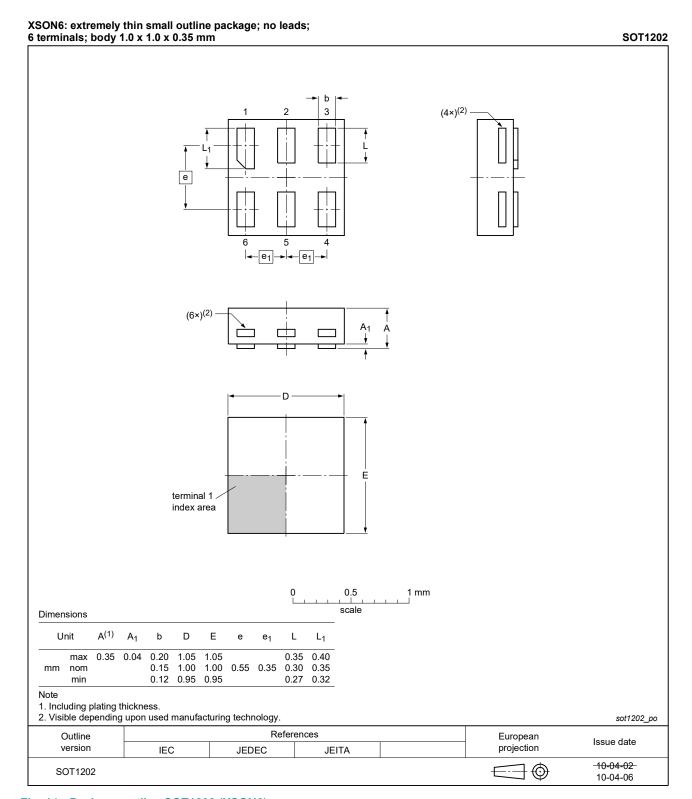


Fig. 14. Package outline SOT1202 (XSON6)

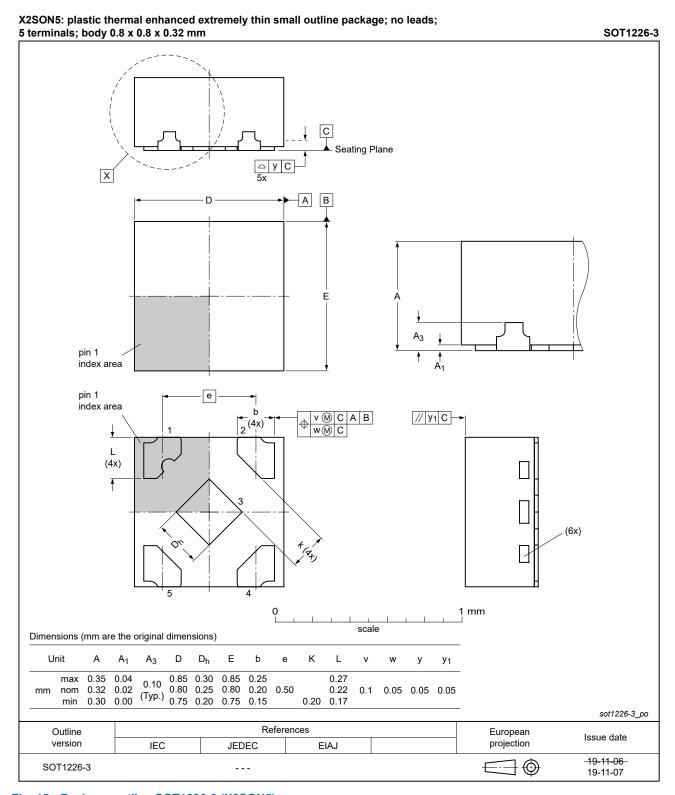


Fig. 15. Package outline SOT1226-3 (X2SON5)

Inverter with open-drain output

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.13	20210924	Product data sheet	-	74LVC1G06 v.12		
Modifications:	SOT1226 (X)Type number	OCCION AND OCCION 2 UPDATED.				
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:		The maximum limits for leakage current and supply current have changed.				
74LVC1G06 v.10	20120629	Product data sheet	-	74LVC1G06 v.9		
Modifications:	 Added type number 74LVC1G06GX (SOT1226) Package outline drawing of SOT886 (Fig. 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	-	-		

Inverter with open-drain output

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.
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Product [short] data sheet	Production	This document contains the product specification.

- Please consult the most recently issued document before initiating or completing a design.
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Inverter with open-drain output

Contents

1.	General description	. 1
2.	Features and benefits	. 1
3.	Ordering information	.2
4.	Marking	. 2
5.	Functional diagram	2
6.	Pinning information	.3
6.1	. Pinning	. 3
6.2	Pin description	. 3
7.	Functional description	. 3
8.	Limiting values	. 4
9.	Recommended operating conditions	.4
10.	Static characteristics	5
11.	Dynamic characteristics	.6
44		
11.	Waveforms and test circuit	. 6
	Waveforms and test circuit Package outline	
12.		. 8
12. 13.	Package outline	. 8 14
12. 13. 14.	Package outline	. 8 14 14

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NLU2GU04BMX1TCG NLU2G04CMX1TCG NLV17SZ06DFT2G NCV1729SN35T1G TC74VHC04FK(EL,K) NLV74HC04ADTR2G
NLU1G04AMUTCG NLX2G04CMUTCG NLU1GT14AMUTCG NLU1G04CMUTCG NL17SZU04P5T5G NL17SG14DFT2G
74LVC06ADTR2G 74LVC04ADR2G NLV37WZ04USG NLX3G14FMUTCG NL17SZ04P5T5G NLV17SG14DFT2G 74ACT14SC
BU4069UBF-E2 EMPP008Z NLV14106BDTR2G NLV74AC14DTR2G SN74HCT04DE4 ODE-3-120023-1F12 74VHCT04AM SV004IE51C TC74HC04APF TC7SH04F,LJ(CT CD74HC14M96 TC7W14FK,LF 74VHC14MTCX 74LCX14MTC SN74LVC1GU04DBVR
SN74LVC14APWR NLU1G14BMX1TCG NLU2G04AMX1TCG NLU2G14AMX1TCG NLU3G14AMX1TCG NLVVHC1G04DFT2G
NLX2G04CMX1TCG NLX3G14AMX1TCG