74LVC1G07

Buffer with open-drain output

Rev. 11 — 29 June 2012

Product data sheet

1. General description

The 74LVC1G07 provides the non-inverting buffer.

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_{OFF} . The I_{OFF} circuitry disables the output, preventing the 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
- 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



3. Ordering information

Table 1. Ordering information

Type number	Package							
	Temperature range	Name	Description	Version				
74LVC1G07GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74LVC1G07GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74LVC1G07GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886				
74LVC1G07GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1 \times 0.5$ mm	SOT891				
74LVC1G07GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115				
74LVC1G07GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 \times 1.0 \times 0.35 mm	SOT1202				
74LVC1G07GX	–40 °C to +125 °C	X2SON5	X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body $0.8\times0.8\times0.35$ mm	SOT1226				

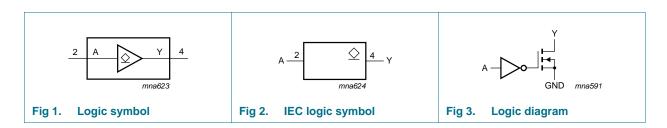
4. Marking

Table 2. Marking

Type number	Marking code[1]
74LVC1G07GW	VS
74LVC1G07GV	V07
74LVC1G07GM	VS
74LVC1G07GF	VS
74LVC1G07GN	VS
74LVC1G07GS	VS
74LVC1G07GX	VS

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

5. Functional diagram

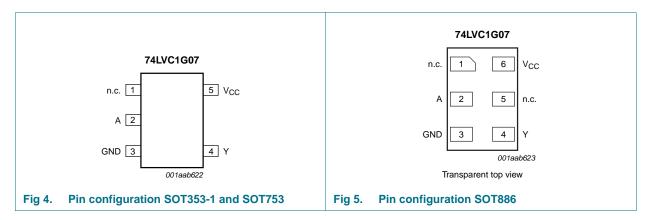


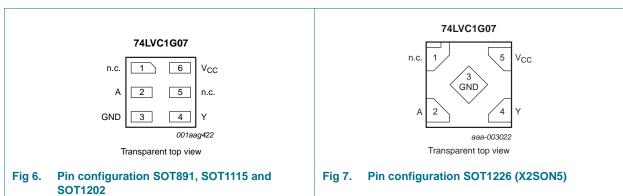
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6. Pinning information

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[1]

Input A	Output Y
L	L
Н	Z

^[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		<u>[1]</u> –0.5	+6.5	V
l _{OK}	output clamping current	V _O < 0 V	-50	-	mA
Vo	output voltage	Active mode	<u>[1]</u> –0.5	+6.5	V
		Power-down mode	<u>[1][2]</u> –0.5	+6.5	V
lo	output current	$V_0 = 0 \text{ V to } 6.5 \text{ V}$	-	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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	<u>[3]</u> _	250	mW

^[1] 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. 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 a		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

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

^[3] For TSSOP5 and SC-74A packages: above 87.5 $^{\circ}$ C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 and X2SON5 package: above 118 $^{\circ}$ 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			+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
V _{IH} HIGH-level	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	0.65V _{CC}	-	V	
	input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	-	-	1.7	-	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	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	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	-	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	$V_I = V_{IH}$ or V_{IL}						
	output voltage	$I_O = 100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	0.10	-	0.10	V
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	-	0.70	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.30	-	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.40	-	0.60	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.80	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	-	0.80	V
II	input leakage current	$V_{I} = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	[2] -	±0.1	±5	-	±100	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	±10	-	±100	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	±0.1	±10	-	±200	μΑ
I _{CC}	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	-	200	μΑ
ΔI_{CC}	additional supply current	1 - 1 7 1 00 7	[2] -	5	500	-	5000	μΑ
Cı	input capacitance	$V_{CC} = 3.3 \text{ V}; V_I = \text{GND to } V_{CC}$	-	5.0	-	-	-	pF

^[1] All typical values are measured at T_{amb} = 25 °C.

^[2] These typical values are measured at V_{CC} = 3.3 V.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for load 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	2.6	6.7	1.0	8.4	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.5	1.7	5.5	0.5	7.0	ns
		$V_{CC} = 2.7 \text{ V}$		0.5	2.3	4.7	0.5	6.0	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		0.5	2.2	4.2	0.5	5.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		0.5	1.6	3.5	0.5	4.5	ns
C_{PD}	power dissipation capacitance	$V_I = GND$ to V_{CC} ; $V_{CC} = 3.3 \text{ V}$	[3]	-	7.0	-	-	-	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.

[3] 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;

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

12. Waveforms

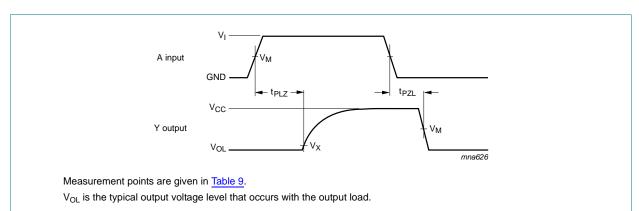


Fig 8. The input (A) to output (Y) propagation delays

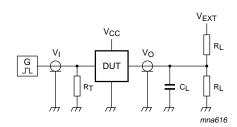
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^[2] t_{pd} is the same as t_{PLZ} and t_{PZL} .

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	



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_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}	VI	t _r , t _f	C _L	R _L	t _{PZL} , t _{PLZ}
1.65 V to 1.95 V	V _{CC}	\leq 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	\leq 2.5 ns	50 pF	500Ω	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}

13. Package outline

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

SOT353-1

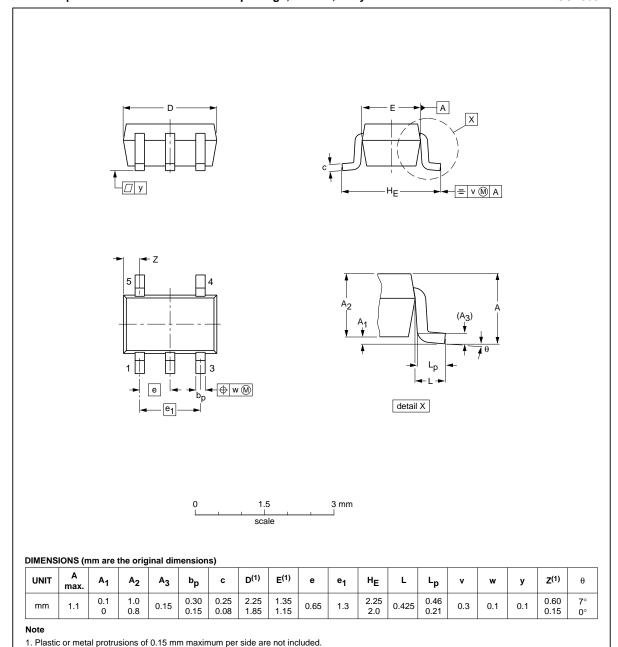


Fig 10. Package outline SOT353-1 (TSSOP5)

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REFERENCES

JEDEC

MO-203

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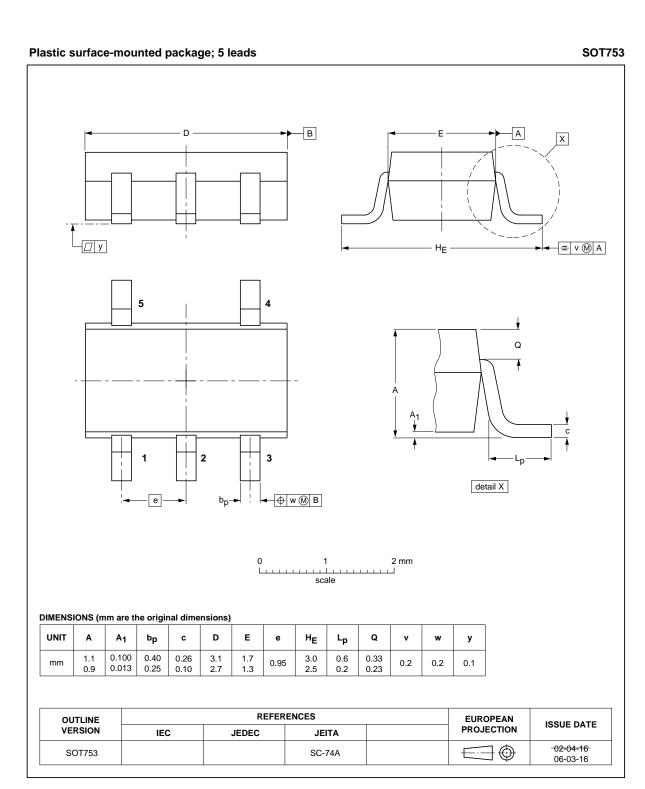


Fig 11. Package outline SOT753 (SC-74A)

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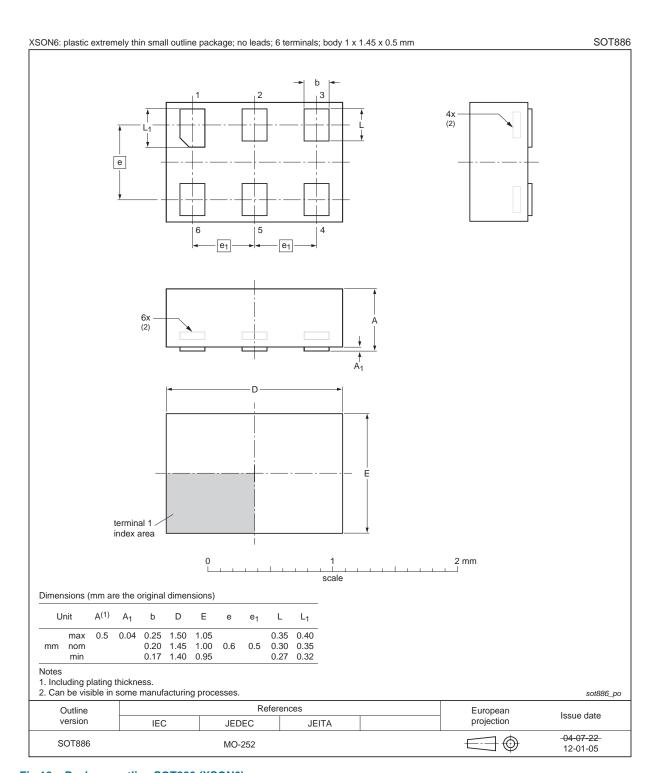


Fig 12. Package outline SOT886 (XSON6)

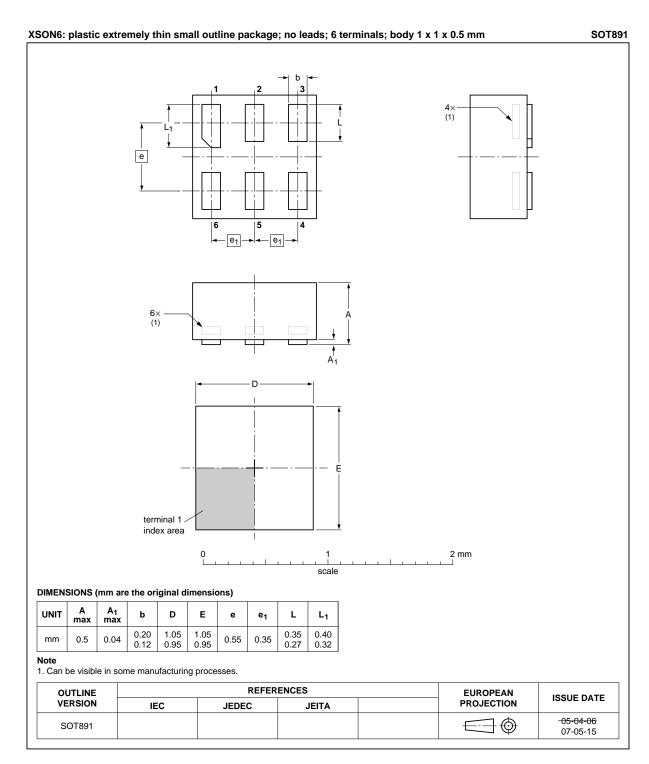


Fig 13. Package outline SOT891 (XSON6)

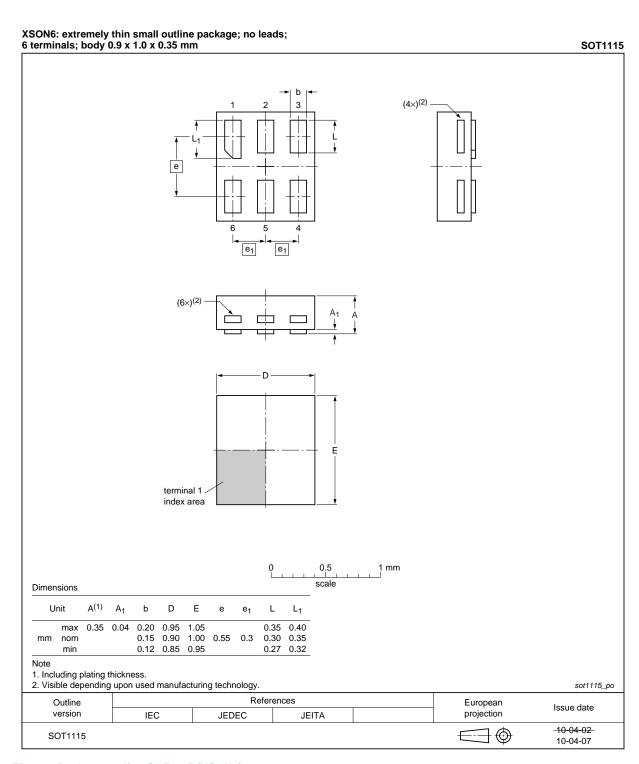


Fig 14. Package outline SOT1115 (XSON6)

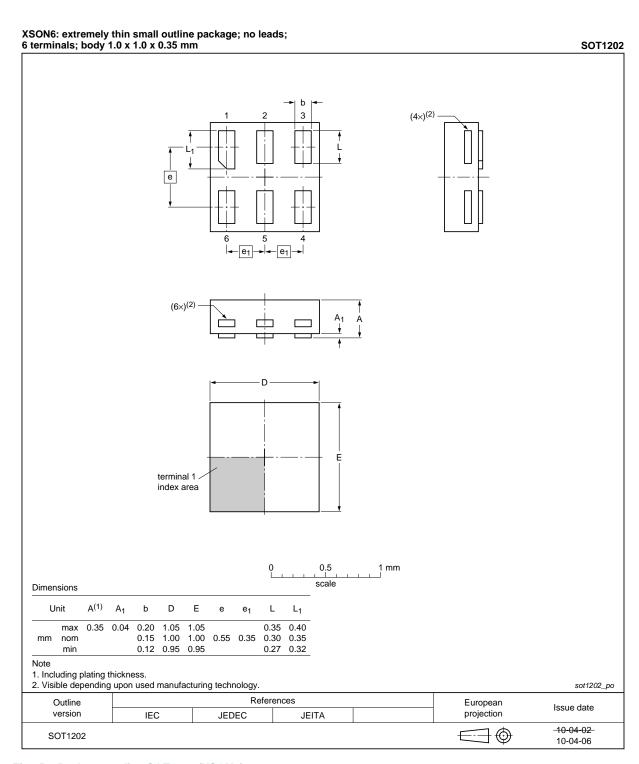


Fig 15. Package outline SOT1202 (XSON6)

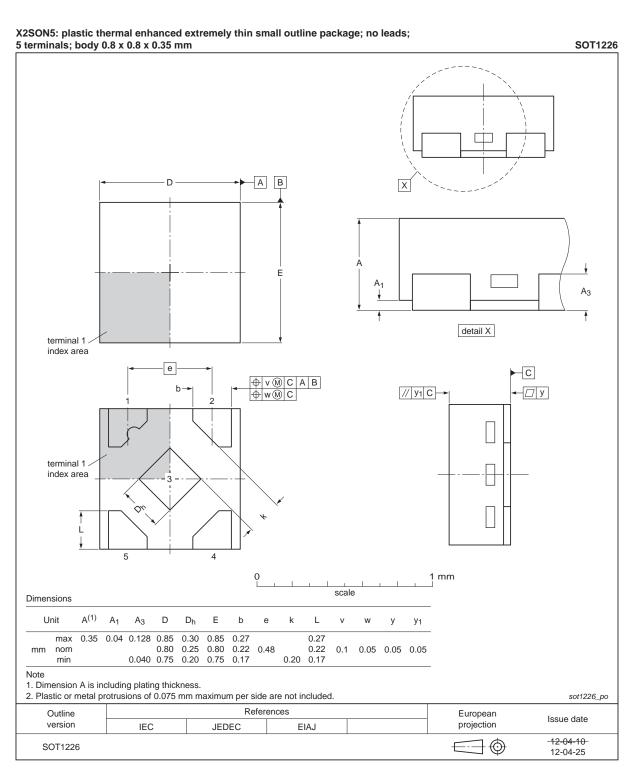


Fig 16. Package outline SOT1226 (X2SON5)

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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
74LVC1G07 v.11	20120629	Product data sheet	-	74LVC1G07 v.10
Modifications:	 Added type 	number 74LVC1G07GX (SC)T1226)	
	 Package ou 	ıtline drawing of SOT886 (Fig	gure 12) modified.	
74LVC1G07 v.10	20111207	Product data sheet	-	74LVC1G07 v.9
Modifications:	 Legal pages 	s updated.		
74LVC1G07 v.9	20100824	Product data sheet	-	74LVC1G07 v.8
74LVC1G07 v.8	20070717	Product data sheet	-	74LVC1G07 v.7
74LVC1G07 v.7	20070515	Product data sheet	-	74LVC1G07 v.6
74LVC1G07 v.6	20040907	Product specification	-	74LVC1G07 v.5
74LVC1G07 v.5	20030307	Product specification	-	74LVC1G07 v.4
74LVC1G07 v.4	20021002	Product specification	-	74LVC1G07 v.3
74LVC1G07 v.3	20020528	Product specification	-	74LVC1G07 v.2
74LVC1G07 v.2	20010406	Product specification	-	74LVC1G07 v.1
74LVC1G07 v.1	20001122	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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