Buffers with open-drain outputs Rev. 13 — 16 August 2023

**Product data sheet** 

### 1. General description

The 74LVC2G07 is a dual buffer 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<sub>CC</sub> = 3.0 V)
- CMOS low power dissipation
- Direct interface with TTL levels
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA
- 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



## 3. Ordering information

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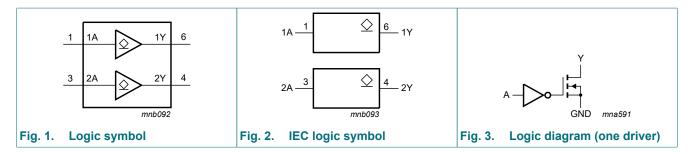
Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G07GW	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	<u>SOT363-2</u>
74LVC2G07GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	<u>SOT457</u>
74LVC2G07GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	<u>SOT886</u>
74LVC2G07GN	-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>
74LVC2G07GS	-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>
74LVC2G07GX	-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	<u>SOT1255-2</u>

### 4. Marking

Marking code[1]
V7
V07
V7
V7
V7
V7

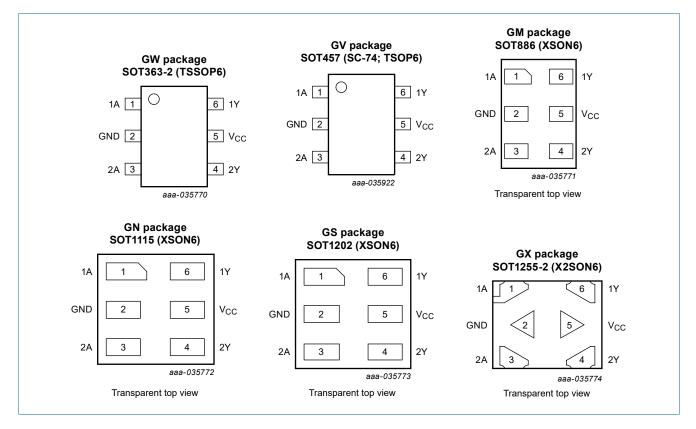
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



### 6. Pinning information





### 6.2. Pin description

#### Table 3. Pin description

Symbol	Pin	Description
1A	1	data input
GND	2	ground (0 V)
2A	3	data input
2Y	4	data output
V <sub>CC</sub>	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	L
Н	Z

### 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	Мах	Unit
V <sub>CC</sub>	supply voltage			-0.5	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>1</sub> < 0 V		-50	-	mA
VI	input voltage		[1]	-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	[1]	-0.5	+6.5	V
		Power-down mode; $V_{CC}$ = 0 V	[1]	-0.5	+6.5	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V 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 <sub>amb</sub> = -40 °C to +125 °C	[2]	-	250	mW

The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed. [1] [2]

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

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: Ptot 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

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

### **10. Static characteristics**

#### Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ <mark>[1]</mark>	Max	Unit
T <sub>amb</sub> = -4	0 °C to +85 °C	·				
VIH	HIGH-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 x 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 x V <sub>CC</sub>	-	-	V
	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	-	-	0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3 x V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		$I_{O}$ = 100 µA; $V_{CC}$ = 1.65 V to 5.5 V	-	-	0.10	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.30	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.40	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.55	V
l <sub>l</sub>	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	μA
I <sub>OZ</sub>	OFF-state output current	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{O} = V_{CC} \text{ or GND};$ $V_{CC} = 5.5 \text{ V}$	-	±0.1	±2	μA
I <sub>OFF</sub>	power-off leakage current	$V_{1} \text{ or } V_{0} = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 1.65 V to 5.5 V	-	0.1	4	μA
ΔI <sub>CC</sub>	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$ ; [2] $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	5	500	μA
CI	input capacitance		-	2.5	-	pF

### Buffers with open-drain outputs

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T <sub>amb</sub> = -4	0 °C to +125 °C					
VIH	HIGH-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 x 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 x V <sub>CC</sub>	-	-	V
V <sub>IL</sub> LOW-level voltage	LOW-level input	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 x V <sub>CC</sub>	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	-	-	0.8	V
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.3 x V <sub>CC</sub>	V
V <sub>OL</sub>	LOW-level output voltage	$V_{I} = V_{IH} \text{ or } V_{IL}$				
		$I_{O}$ = 100 µA; $V_{CC}$ = 1.65 V to 5.5 V	-	-	0.10	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.70	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.60	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.80	V
		I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V	-	-	0.80	V
l <sub>l</sub>	input leakage current	$V_1$ = 5.5 V or GND; $V_{CC}$ = 0 V to 5.5 V	-	-	±1	μA
I <sub>OZ</sub>	OFF-state output current	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{O} = V_{CC} \text{ or GND};$ $V_{CC} = 5.5 \text{ V}$	-	-	±2	μA
I <sub>OFF</sub>	power-off leakage current	$V_1 \text{ or } V_0 = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	-	±2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	4	μA
ΔI <sub>CC</sub>	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	-	500	μA

### 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 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 4 [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.5	6.7	1.0	8.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.4	4.3	0.5	5.5	ns
		V <sub>CC</sub> = 2.7 V	1.0	2.3	4.2	1.0	5.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.6	3.7	0.5	4.7	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	1.5	2.9	0.5	3.7	ns
C <sub>PD</sub>	power dissipation capacitance	$V_{I} = GND$ to $V_{CC}$ ; $V_{CC} = 3.3 V$ [3]	-	6.5	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

[2]

 $t_{pd}$  is the same as  $t_{PLZ}$  and  $t_{PZL}$ . C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in µW). [3]

 $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + \sum (C_{L} \times V_{CC}^{2} \times f_{o}) \text{ where:}$ 

 $f_i$  = input frequency in MHz;

 $f_o = output$  frequency in MHz;

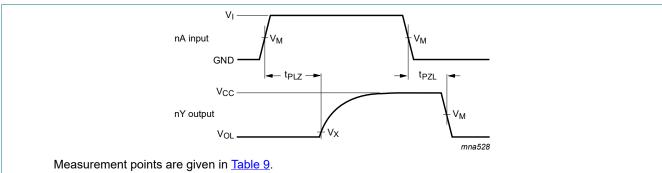
 $C_L$  = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

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

### 11.1. Waveform and test circuit



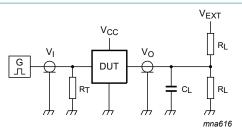
V<sub>OL</sub> is the typical output voltage level that occur with the output load.

#### The input (nA) to output (nY) propagation delays Fig. 4.

#### **Table 9. Measurement points**

Supply voltage	Input	Output	
V <sub>cc</sub>	V <sub>M</sub>	V <sub>M</sub>	Vx
1.65 V to 1.95 V	0.5 x V <sub>CC</sub>	0.5 x V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V
2.3 V to 2.7 V	0.5 x V <sub>CC</sub>	0.5 x V <sub>CC</sub>	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 x V <sub>CC</sub>	0.5 x V <sub>CC</sub>	V <sub>OL</sub> + 0.3 V

### Buffers with open-drain outputs



Test data is given in Table 10.

Definitions for test circuit:

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

 $C_{\text{L}}$  = 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.

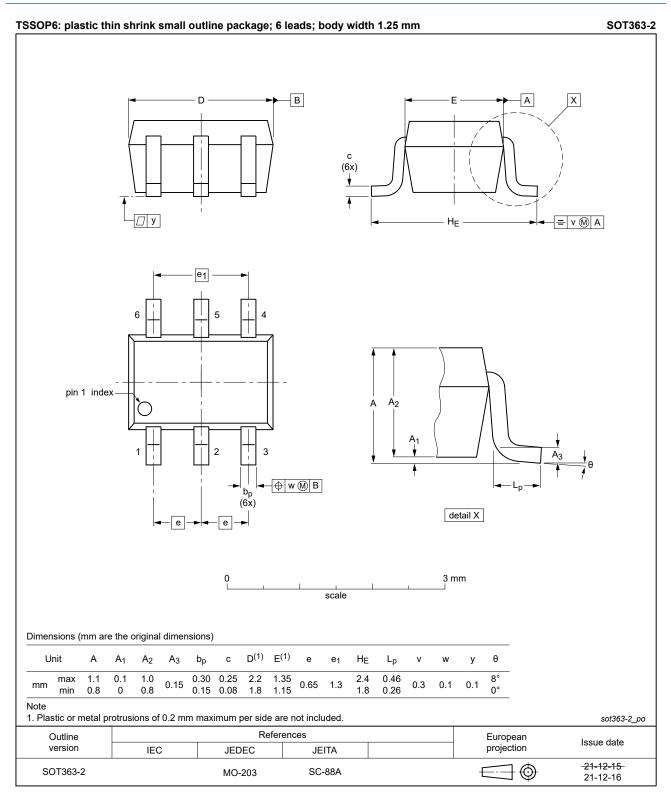
#### Fig. 5. Test circuit for measuring switching times

#### Table 10. Test data

Supply voltage	Input		Load		V <sub>EXT</sub>
V <sub>cc</sub>	Vi	t <sub>r</sub> , t <sub>f</sub>	CL	RL	t <sub>PZL</sub> , t <sub>PLZ</sub>
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	2 x V <sub>CC</sub>
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	500 Ω	2 x 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 <sub>CC</sub>	≤ 2.5 ns	50 pF	500 Ω	2 x V <sub>CC</sub>

#### Buffers with open-drain outputs

### 12. Package outline



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

SOT457

### Buffers with open-drain outputs



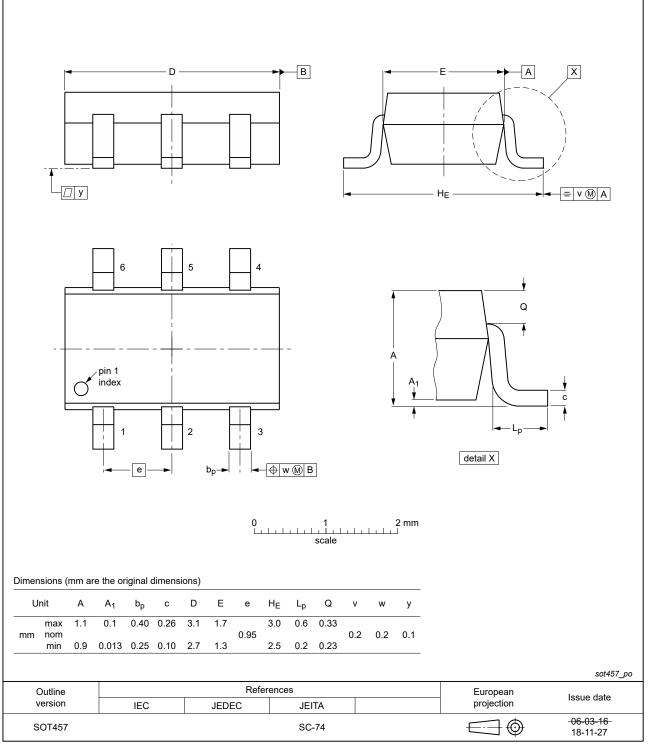


Fig. 7. Package outline SOT457 (SC-74; TSOP6)

### Buffers with open-drain outputs

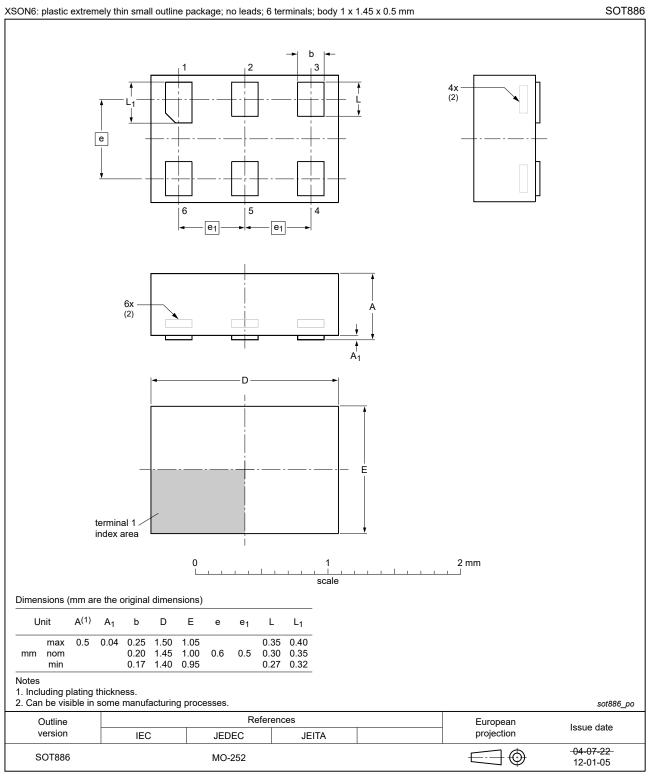
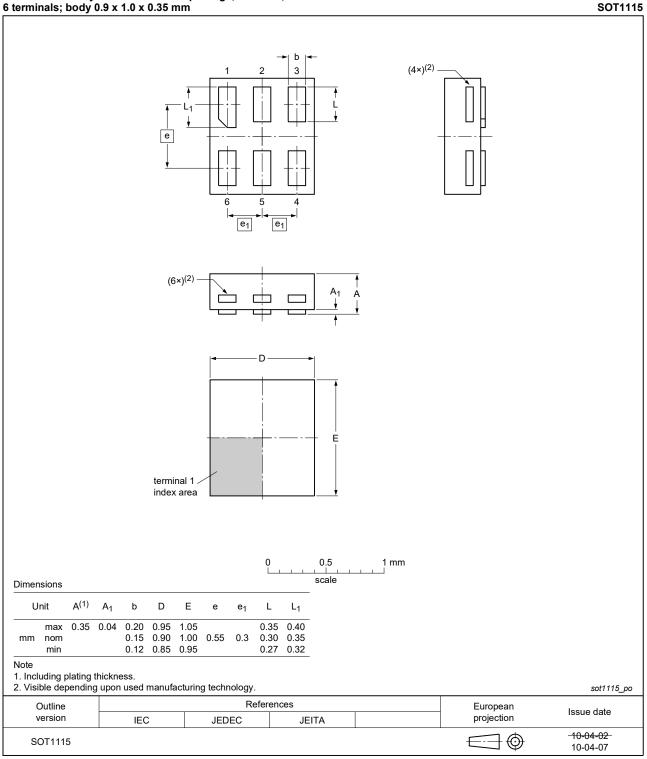


Fig. 8. Package outline SOT886 (XSON6)

#### Buffers with open-drain outputs

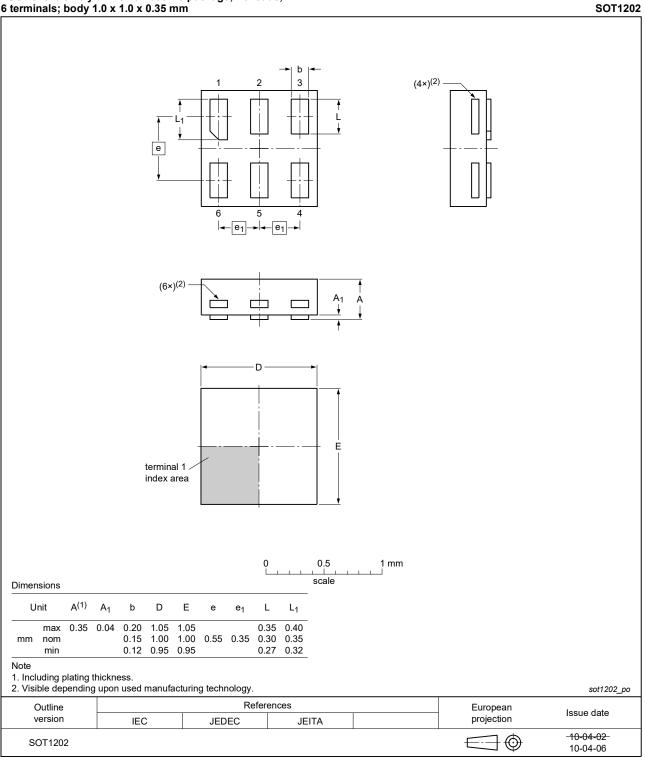
#### XSON6: extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm





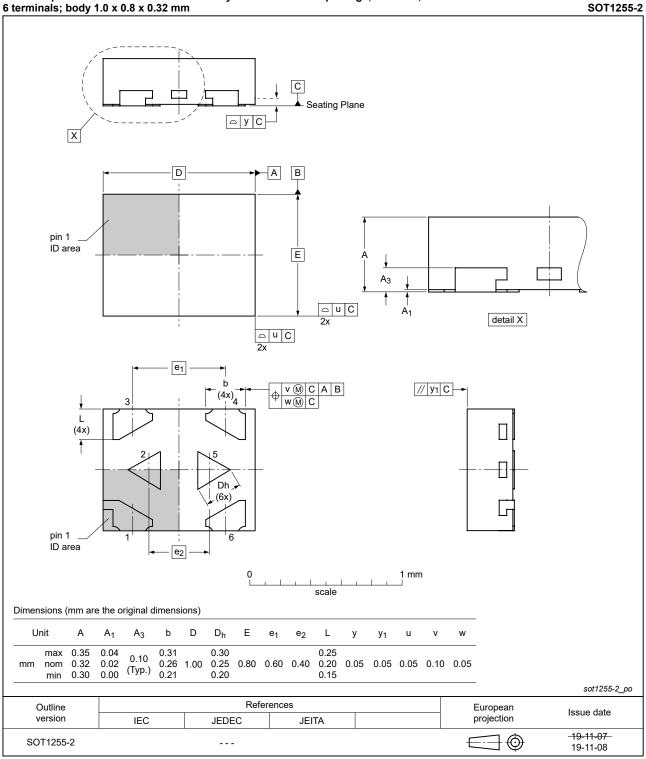
#### Buffers with open-drain outputs

#### XSON6: extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm



### Fig. 10. Package outline SOT1202 (XSON6)

#### Buffers with open-drain outputs



# X2SON6: plastic thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.0 x 0.8 x 0.32 mm

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

### 13. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

# 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LVC2G07 v.13	20230816	Product data sheet	-	74LVC2G07 v.12		
Modifications:	• <u>Section 2</u> : E	• <u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LVC2G07 v.12	20220124	Product data sheet	-	74LVC2G07 v.11		
Modifications:	Package S	Package SOT363 (SC-88) changed to SOT363-2 (SC-88).				
74LVC2G07 v.11	20210929	Product data sheet	-	74LVC2G07 v.10		
Modifications:	<ul> <li>SOT1255 ()</li> <li><u>Table 5</u>: De</li> <li><u>Fig. 7</u>: Pack</li> </ul>	<ul> <li>SOT1255 (X2SON6) package changed to SOT1255-2 (X2SON6) package.</li> <li><u>Table 5</u>: Derating values for P<sub>tot</sub> total power dissipation updated.</li> <li><u>Fig. 7</u>: Package outline drawing SOT457 updated.</li> </ul>				
74LVC2G07 v.10	20170821	Product data sheet	-	74LVC2G07 v.9		
Modifications:	guidelines o	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>				
74LVC2G07 v.9	20161212	Product data sheet	-	74LVC2G07 v.8		
Modifications:	• <u>Table 7</u> : The	• <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC2G07 v.8	20150923	Product data sheet	-	74LVC2G07 v.7		
Modifications:	Added type number 74LVC2G07GX (SOT1255/X2SON6).					
74LVC2G07 v.7	20120704	Product data sheet	-	74LVC2G07 v.6		
Modifications:	Package outline drawing of SOT886 ( <u>Fig. 8</u> ) modified.					
74LVC2G07 v.6	20111130	Product data sheet	-	74LVC2G07 v.5		
Modifications:	Legal pages updated.					
74LVC2G07 v.5	20100806	Product data sheet	-	74LVC2G07 v.4		
74LVC2G07 v.4	20070521	Product data sheet	-	74LVC2G07 v.3		
74LVC2G07 v.3	20040908	Product data sheet	-	74LVC2G07 v.2		
74LVC2G07 v.2	20040319	Product data sheet	-	74LVC2G07 v.1		
74LVC2G07 v.1	20030825	Product data sheet	-	-		

### 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <u>https://www.nexperia.com</u>.

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Buffers with open-drain outputs

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#### Buffers with open-drain outputs

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