Product data sheet



1 General description

The 74LVC2G04 provides the dual inverting buffer.

Inputs 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.

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 inputs 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)
 - JESD8B/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 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.

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3 Ordering information

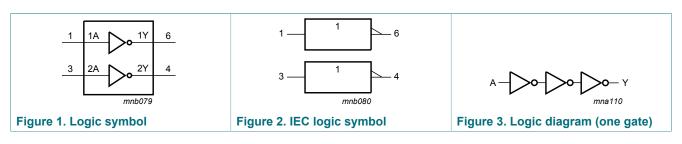
Table 1. Ordering	information			
Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G04GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74LVC2G04GV	-40 °C to +125 °C	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457
74LVC2G04GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC2G04GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74LVC2G04GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC2G04GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74LVC2G04GX	-40 °C to +125 °C	X2SON6	plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 × 0.8 × 0.35 mm	SOT1255

4 Marking

Table 2. Marking				
Type number	Marking code ^[1]			
74LVC2G04GW	V4			
74LVC2G04GV	V04			
74LVC2G04GM	V4			
74LVC2G04GF	V4			
74LVC2G04GN	V4			
74LVC2G04GS	V4			
74LVC2G04GX	V4			

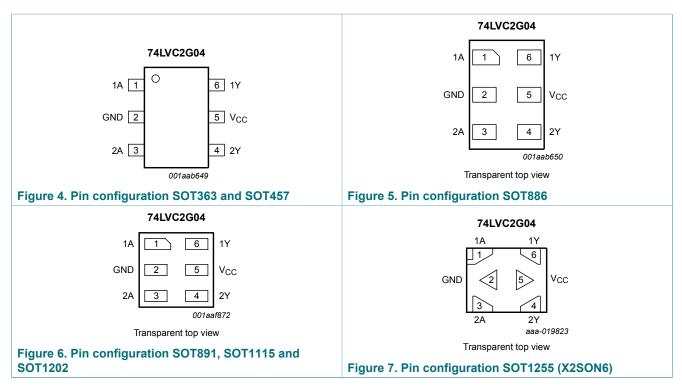
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5 Functional diagram



6 Pinning information

6.1 Pinning



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 _{CC}	5	supply voltage		
1Y	6	data output		

7 **Functional description**

Table 4. Function table ^[1]

Input	Output
nA	nY
L	Н
Н	L

H = HIGH voltage level; L = LOW voltage level. [1]

Limiting values 8

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 ₁ < 0 V		-50	-	mA
VI	input voltage		[1]	-0.5	+6.5	V
I _{ОК}	output clamping current	$V_{\rm O}$ > $V_{\rm CC}$ or $V_{\rm O}$ < 0 V		-	±50	mA
Vo	output voltage	Active mode [1] [2]	-0.5	V _{CC} + 0.5	V
		Power-down mode [1] [2]	-0.5	+6.5	V
Ι _Ο	output current	$V_{O} = 0 V$ to V_{CC}		-	±50	mA
I _{CC}	supply current			-	100	mA
I _{GND}	ground current			-100	-	mA
P _{tot}	total power dissipation	T_{amb} = -40 °C to +125 °C	[3]	-	250	mW
T _{stg}	storage temperature			-65	+150	°C

[1]

[2] [3]

The input and output voltage ratings may be exceeded if the input and output current ratings are observed. When V_{CC} = 0 V (Power-down mode), the output voltage can be 5.5 V in normal operation. For SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K. For X2SON6 and XSON6 packages: above 118 °C the value of Ptot derates linearly with 7.8 mW/K.

9 Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Мах	Unit
V _{CC}	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	V _{CC}	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

Table 6. Recommended operating conditions

10 Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	meter Conditions		-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Тур ^[1]	Max	Min	Мах	
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 _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	0.95	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	-	-	1.7	-	V
		I_{O} = -12 mA; V_{CC} = 2.7 V	2.2	-	-	1.9	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	2.0	-	V
		I_{O} = -32 mA; V_{CC} = 4.5 V	3.8	-	-	3.4	-	V
V _{OL}	LOW-level output	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	voltage	I _O = 100 μA; V _{CC} = 1.65 V to 5.5 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

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Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Тур ^[1]	Max	Min	Мах	_
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
		I_0 = 32 mA; V_{CC} = 4.5 V	-	-	0.55	-	0.80	V
lı	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	μA
I _{OFF}	power-off leakage current	V_{CC} = 0 V; V _I or V _O = 5.5 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	μA
ΔI _{CC}	additional supply current	per pin; V_{CC} = 2.3 V to 5.5 V; V _I = V _{CC} - 0.6 V; I _O = 0 A	-	5	500	-	500	μA
CI	input capacitance	V_{CC} = 3.3 V; V_{I} = GND to V_{CC}	-	2.5	-	-	-	pF

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

Dynamic characteristics 11

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	Тур ^[1]	Мах	Min	Max	
t _{pd}	propagation delay	nA to nY; see Figure 8 ^[2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	3.5	8.0	1.0	9.5	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	2.2	4.4	1.0	5.4	ns
		V _{CC} = 2.7 V	1.0	2.7	5.2	1.0	7.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.7	4.1	0.5	5.5	ns
		V_{CC} = 4.5 V to 5.5 V	1.0	1.9	3.2	1.0	3.8	ns
C _{PD}	power dissipation capacitance	V_{I} = GND to V_{CC} ; V_{CC} = 3.3 V ^[3]	-	13.5	-	-	-	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. [1]

[2] [3]

 $t_{pd} \text{ is the same as } t_{PLH} \text{ and } t_{PHL}.$ $C_{PD} \text{ is used to determine the dynamic power dissipation (P_D in µW). } P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$

 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 Waveforms and test circuit

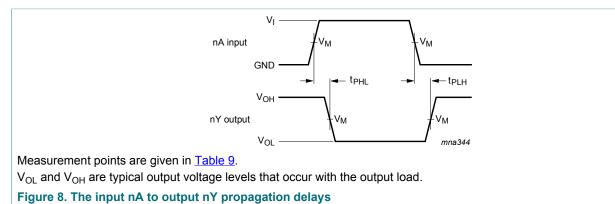
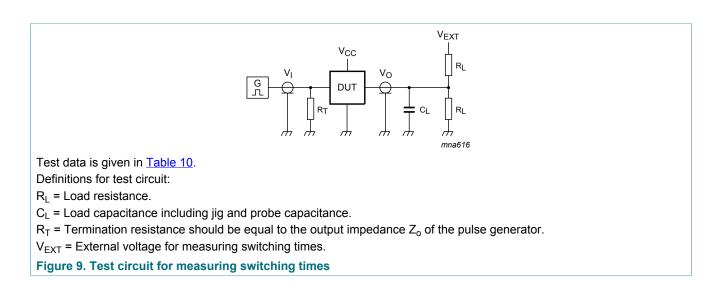


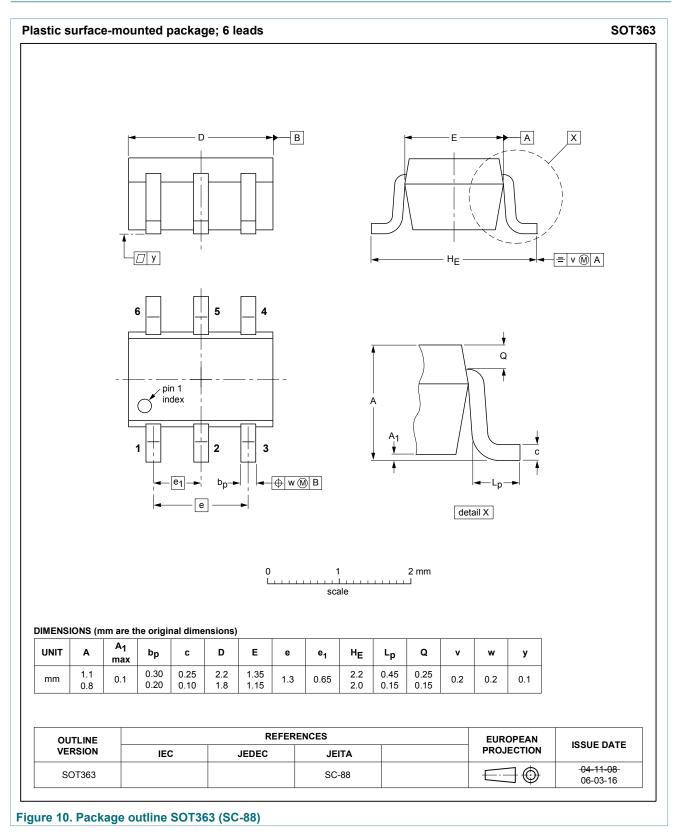
Table 9. Measurement points				
Supply voltage	Input	Output		
V _{CC}	V _M	V _M		
1.65 V to 1.95 V	0.5V _{CC}	0.5V _{CC}		
2.3 V to 2.7 V	0.5V _{CC}	0.5V _{CC}		
2.7 V	1.5 V	1.5 V		
3.0 V to 3.6 V	1.5 V	1.5 V		
4.5 V to 5.5 V	0.5V _{CC}	0.5V _{CC}		



Supply voltage	Input	Input		Load		
V _{cc}	VI	$t_r \equiv t_f$	CL	RL	t _{PLH} , t _{PHL}	
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	

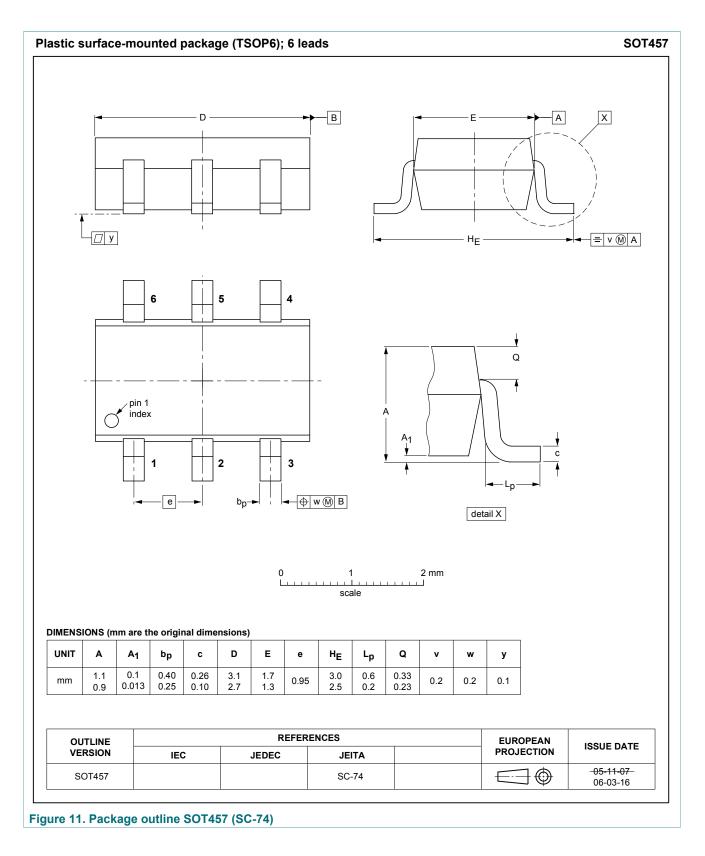
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12 Package outline

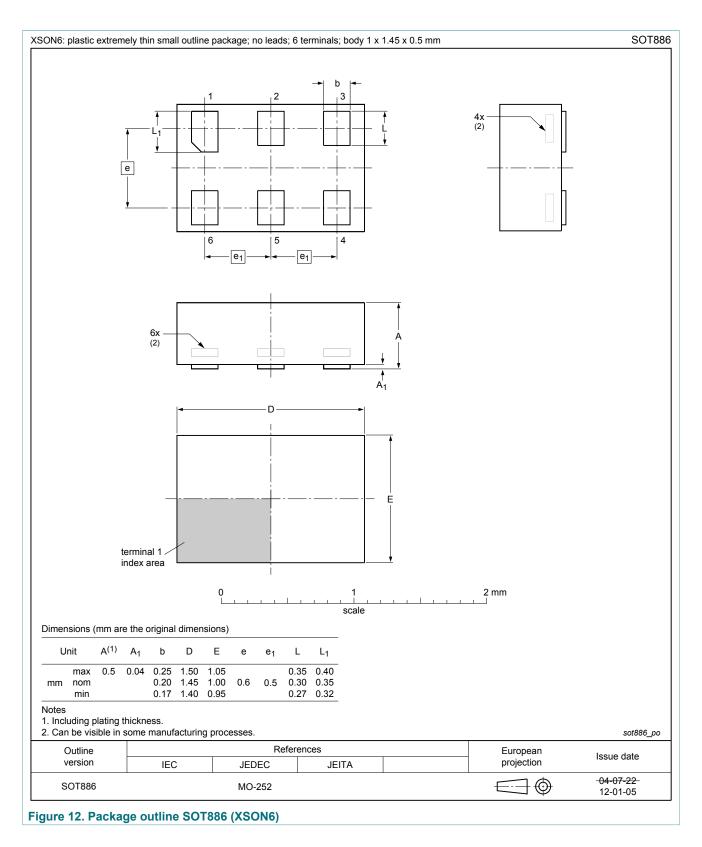


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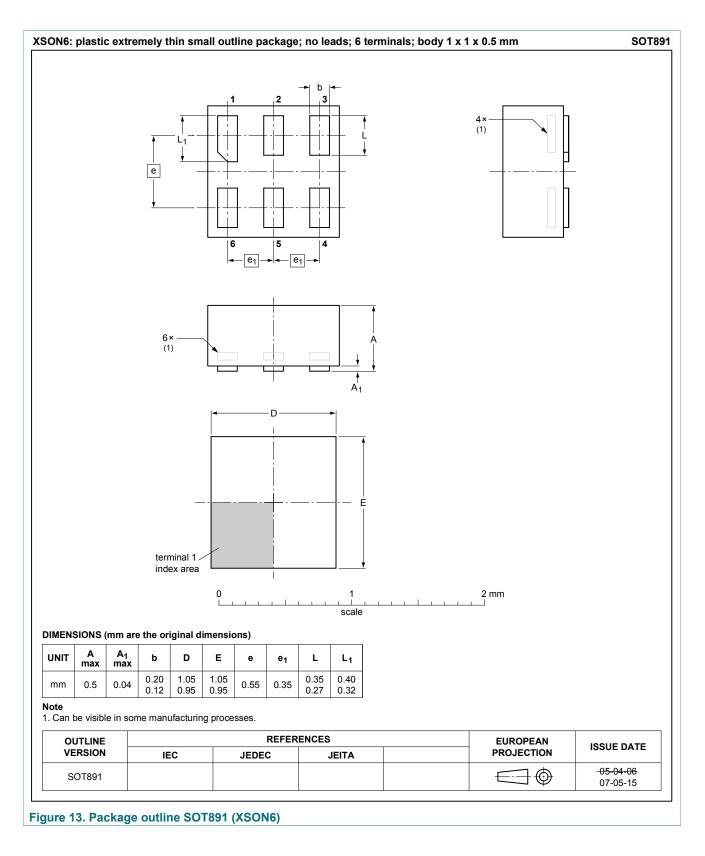
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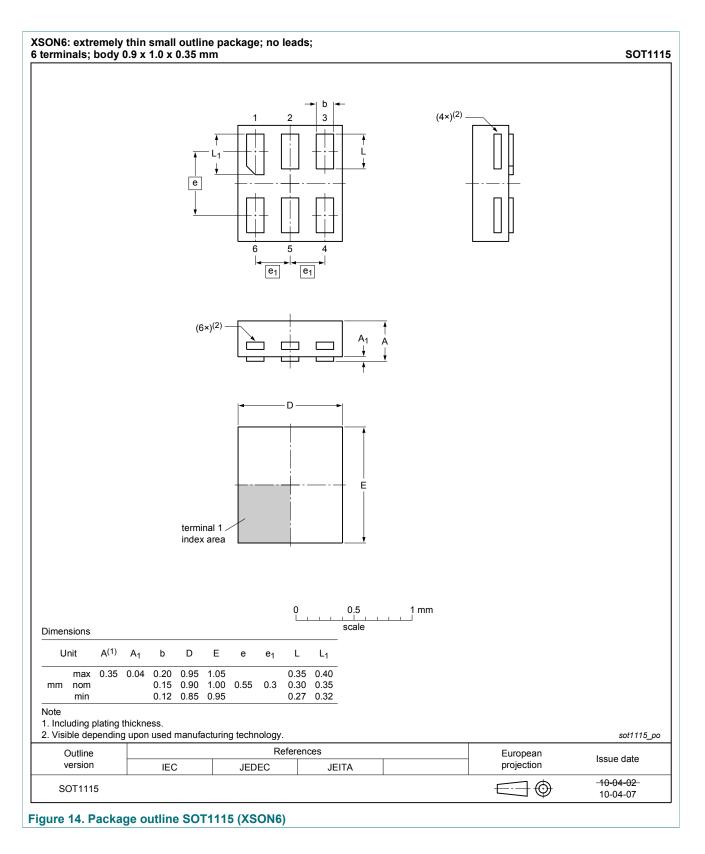


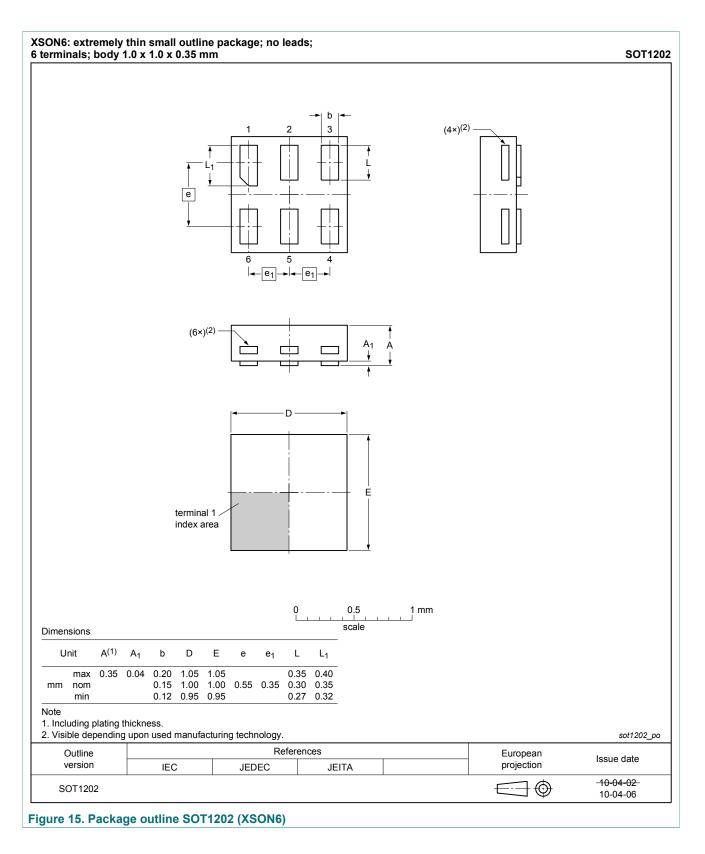
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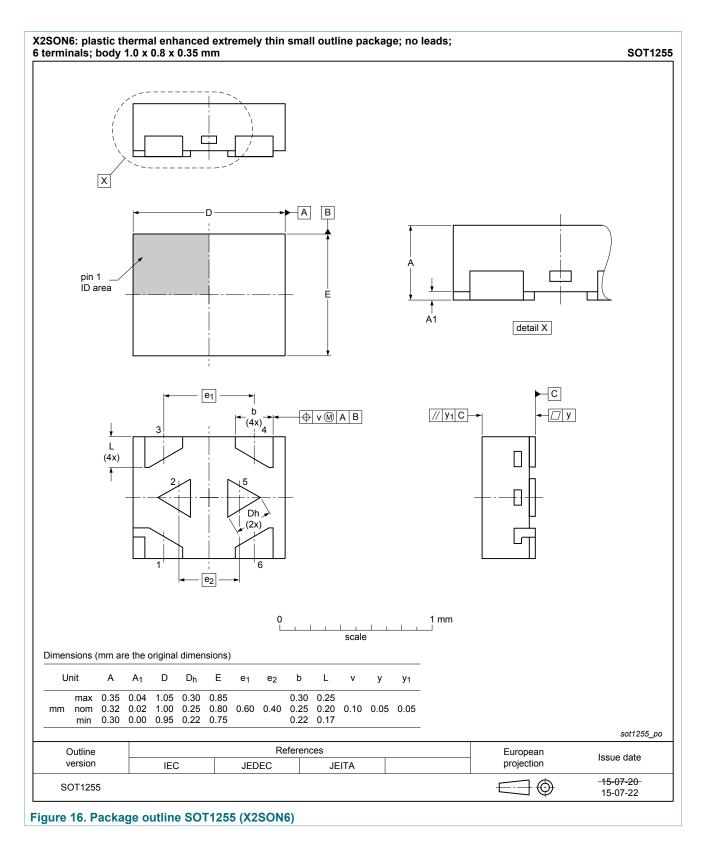
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13 Abbreviations

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		
74LVC2G04 v.10	20170522	Product data sheet	-	74LVC2G04 v.9		
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. Pin 6 description updated. <u>Section 6.2</u> 					
74LVC2G04 v.9	20161212	Product data sheet	-	74LVC2G04 v.8		
Modifications:	• <u>Table 7</u> : The maximum limits for leakage current and supply current have changed.					
74LVC2G04 v.8	20150917	Product data sheet	-	74LVC2G04 v.7		
Modifications:	Added type number 74LVC2G04GX (SOT1255/X2SON6).					
74LVC2G04 v.7	20140910	Product data sheet	-	74LVC2G04 v.6		
Modifications:	Package outline drawing of SOT886 (Figure 12) modified.					
74LVC2G04 v.6	20111206	Product data sheet	-	74LVC2G04 v.5		
74LVC2G04 v.5	20100805	Product data sheet	-	74LVC2G04 v.4		
74LVC2G04 v.4	20070725	Product data sheet	-	74LVC2G04 v.3		
74LVC2G04 v.3	20070216	Product data sheet	-	74LVC2G04 v.2		
74LVC2G04 v.2	20040915	Product specification	-	74LVC2G04 v.1		
74LVC2G04 v.1	20030722	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.
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. [1]

The term 'short data sheet' is explained in section "Definitions".

[2] [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 URL http://www.nexperia.com.

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