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.



3. Ordering information

Table 1.	Ordering	information
	Ordering	mormation

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	TSOP6	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 \times 1.45 \times 0.5 mm	SOT886
74LVC2G04GF	–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
74LVC2G04GN	–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
74LVC2G04GS	–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

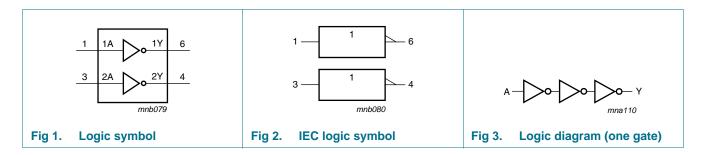
4. Marking

Table 2. Marking

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

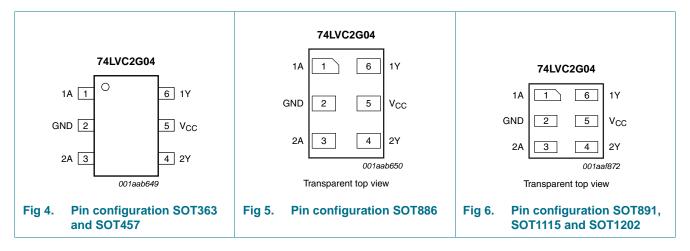
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

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 input

7. Functional description

Table 4.Function table^[1]

Input	Output
nA	nY
L	Н
Н	L

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

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		<u>[1]</u> –0.5	+6.5	V
I _{OK}	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
lo	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	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$	<u>[3]</u> _	250	mW
T _{stg}	storage temperature		-65	+150	°C

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

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

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
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
$\Delta t / \Delta V$	input transition rise and fall rate	V_{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
		$V_{CC} = 2.7 V \text{ to } 5.5 V$	-	-	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	−40 °	C to +8	5 °C	-40 °C to	+125 °C	Unit
			Min	Typ[1]	Max	Min	Max	
VIH	HIGH-level	V _{CC} = 1.65 V to 1.95 V	$0.65V_{CC}$	-	-	0.65V _{CC}	-	V
	input voltage	V_{CC} = 2.3 V to 2.7 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
VIL	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
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	-	0.8	-	0.8	V
		V_{CC} = 4.5 V to 5.5 V	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
V _{он}	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output voltage	$I_{O} = -100 \ \mu A;$ $V_{CC} = 1.65 \ V \text{ to } 5.5 \ V$	$V_{CC}-0.1$	-	-	$V_{CC}-0.1$	-	V
		$I_{O} = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	0.95	-	V
	$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	V	
		$I_{O} = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.3	-	-	2.0	-	V
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V
V _{OL}	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}$						
	output voltage	$I_{O} = 100 \ \mu A;$ $V_{CC} = 1.65 \ V \text{ to } 5.5 \ V$	-	-	0.10	-	0.10	V
		$I_0 = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	-	0.70	V
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.30	-	0.45	V
		$I_0 = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	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
I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±5	-	±20	μA
I _{OFF}	power-off leakage current	V_{CC} = 0 V; V ₁ or V ₀ = 5.5 V	-	±0.1	±10	-	±20	μA
СС	supply current	$V_{I} = 5.5 V \text{ or GND}; I_{O} = 0 A;$ $V_{CC} = 1.65 V \text{ to } 5.5 V$	-	0.1	10	-	40	μA
VI _{CC}	additional supply current	per pin; $V_{CC} = 2.3 \text{ V}$ to 5.5 V; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$	-	5	500	-	5000	μA
Cı	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.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for load circuit see Figure 8.

Symbol	Symbol Parameter Conditions		−40 °C to +85 °C			–40 °C to	Unit		
				Min	Typ <mark>[1]</mark>	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Figure 7	[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
		$V_{CC} = 3.0 \text{ V} \text{ to } 3.6 \text{ V}$		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	$V_{\rm I}$ = GND to $V_{CC};V_{CC}$ = 3.3 V	<u>[3]</u>	-	13.5	-	-	-	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.

[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

 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;

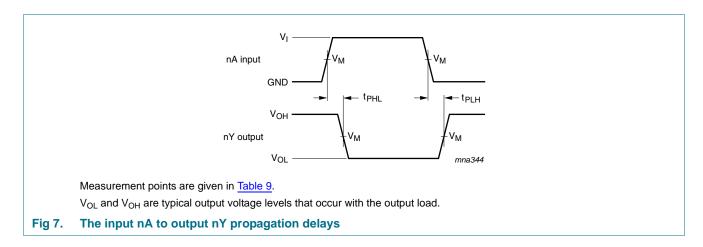
 C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. AC waveforms

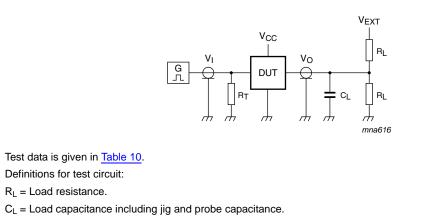


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Table 9.Measurement points

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}



 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 8. Test circuit for measuring switching times

Table 10. Test data

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

Dual inverter

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13. Package outline

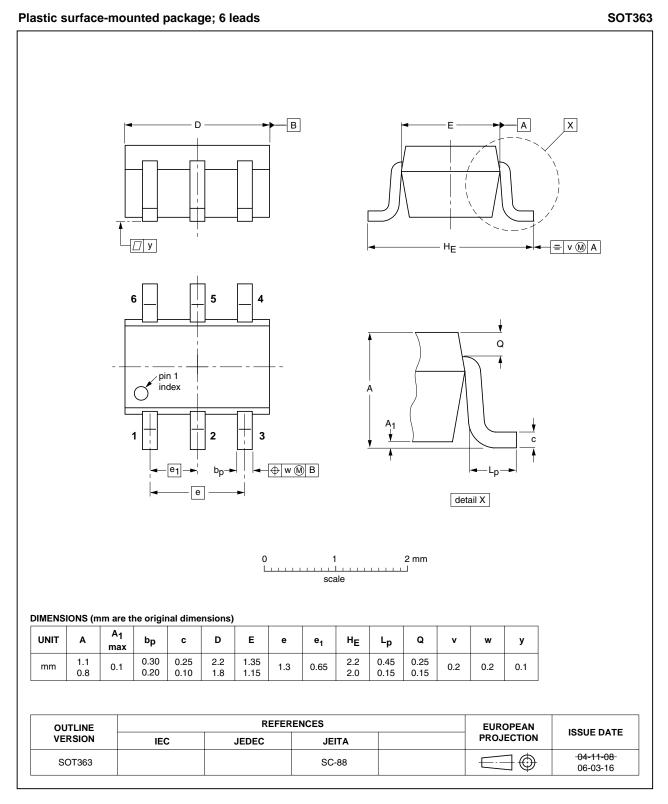


Fig 9. Package outline SOT363 (SC-88)

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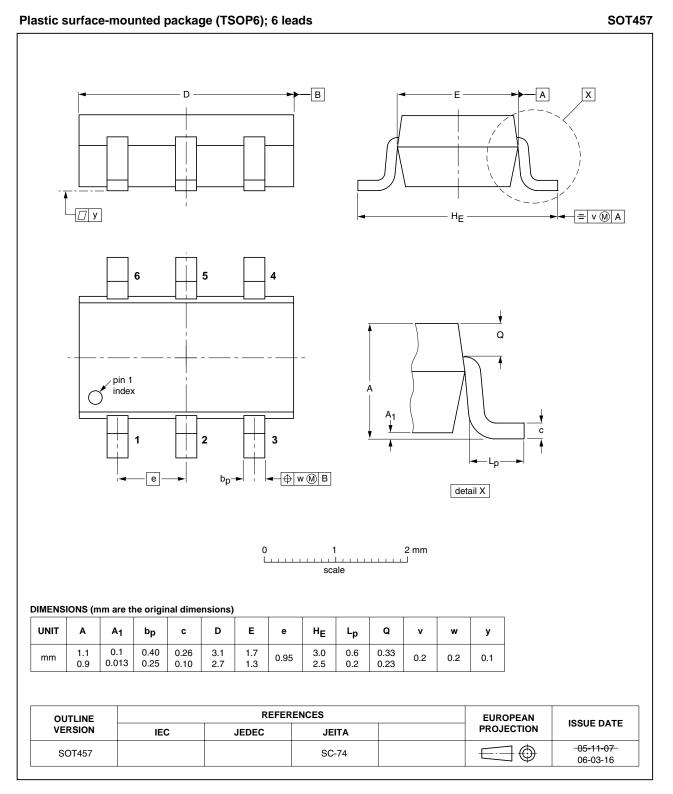
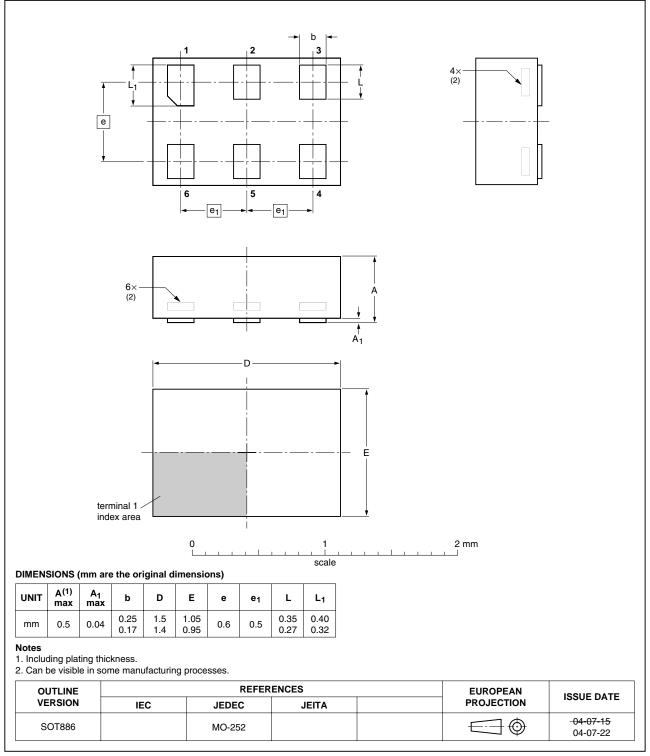


Fig 10. Package outline SOT457 (SC-74)

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SOT886

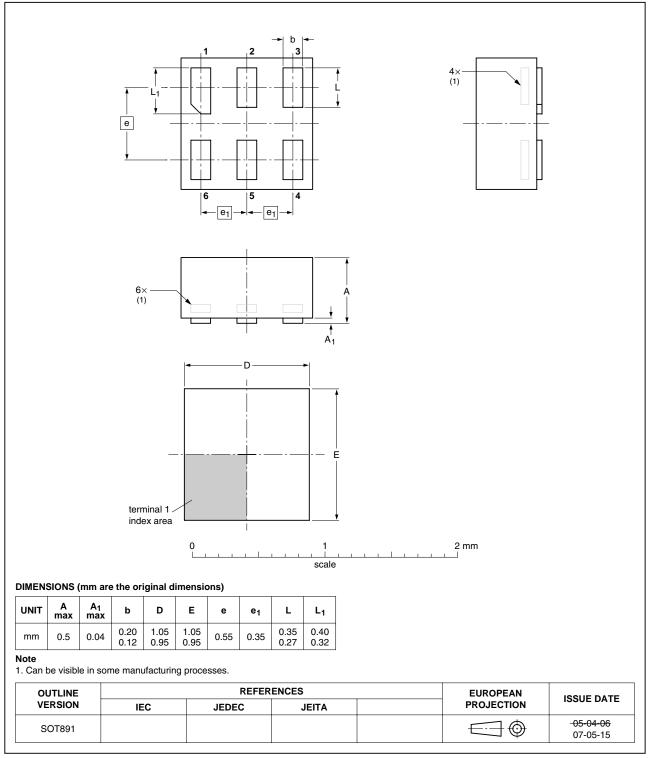


XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

Fig 11. Package outline SOT886 (XSON6)

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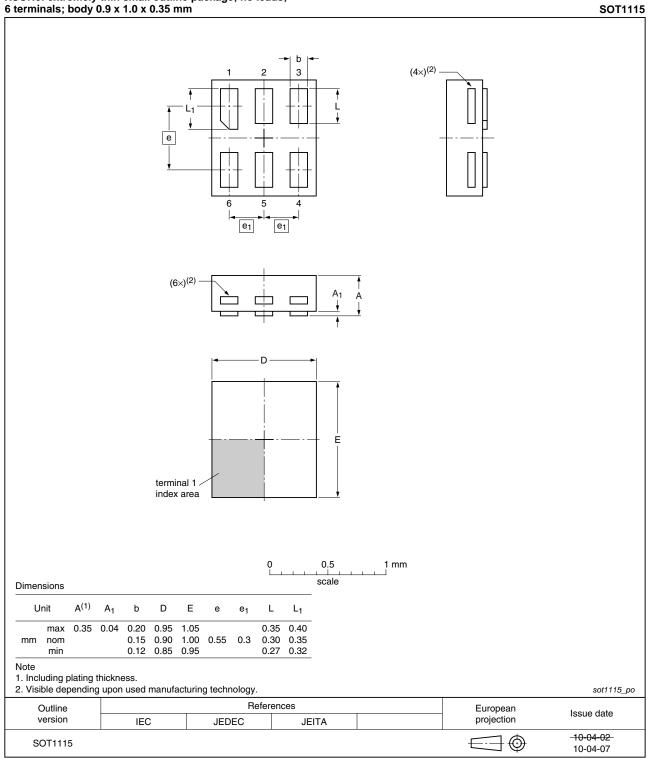
SOT891



XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm

Fig 12. Package outline SOT891 (XSON6)

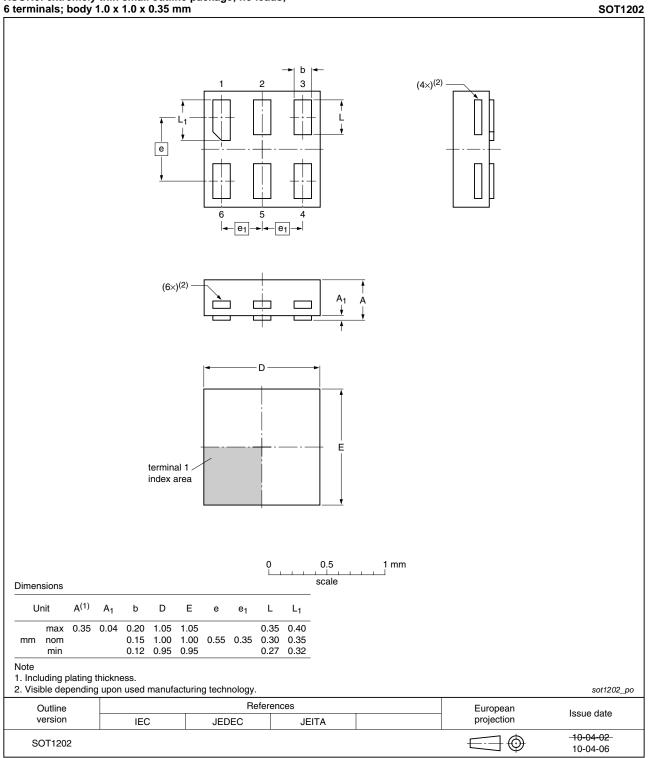
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XSON6: extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm

Fig 13. Package outline SOT1115 (XSON6)

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

Fig 14. Package outline SOT1202 (XSON6)

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14. Abbreviations

Table 11.	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

15. Revision history

Table 12. Revision history					
Document ID	Release date	Data sheet status	Change notice	Supersedes	
74LVC2G04 v.5	20100805	Product data sheet	-	74LVC2G04 v.4	
Modifications:	••	ber 74LVC2G04GN (SOT1115/X ber 74LVC2G04GS (SOT1202/X			
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	-	-	

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.

[1] 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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74LVC2G04

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Date of release: 5 August 2010 Document identifier: 74LVC2G04