

# 74LVC1G04GX,125 Datasheet



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DiGi Electronics Part Number 74LVC1G04GX,125-DG

Manufacturer Nexperia USA Inc.

Manufacturer Product Number 74LVC1G04GX,125

Description IC INVERTER 1CH 1-INP 5X2SON

Detailed Description Inverter IC 1 Channel 5-X2SON (0.80x0.80)



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# **Purchase and inquiry**

Manufacturer Product Number:	Manufacturer:
74LVC1G04GX,125	Nexperia USA Inc.
Series:	Product Status:
74LVC	Active
Logic Type:	Number of Circuits:
Inverter	1
Number of Inputs:	Features:
1	
Voltage - Supply:	Current - Quiescent (Max):
1.65V ~ 5.5V	4 μΑ
Current - Output High, Low:	Input Logic Level - Low:
32mA, 32mA	0.58V ~ 1.65V
Input Logic Level - High:	Max Propagation Delay @ V, Max CL:
1.07V ~ 3.85V	5ns @ 5V, 50pF
Operating Temperature:	Mounting Type:
-40°C ~ 125°C (TA)	Surface Mount
Supplier Device Package:	Package / Case:
5-X2SON (0.80x0.80)	4-XFDFN Exposed Pad
Base Product Number:	
74LVC1G04	

# **Environmental & Export classification**

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	



**Product data sheet** 

### 1. General description

The 74LVC1G04 is a single inverter. 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
- · CMOS low power dissipation
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- ±24 mA output drive (V<sub>CC</sub> = 3.0 V)
- Latch-up performance exceeds 250 mA
- · Direct interface with TTL levels
- 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

**Table 1. Ordering information** 

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G04GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74LVC1G04GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74LVC1G04GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G04GN	-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>
74LVC1G04GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74LVC1G04GX	-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
74LVC1G04GX4	-40 °C to +125 °C	X2SON4	plastic thermal enhanced extremely thin small outline package; no leads; 4 terminals; body 0.6 × 0.6 × 0.32 mm	SOT1269-2
74LVC1G04GZ	-40 °C to +125 °C	XSON5	plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body 1.1 × 0.85 × 0.5 mm	SOT8065-1

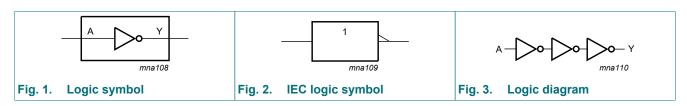
# 4. Marking

Table 2. Marking

Type number	Marking code[1]
74LVC1G04GW	VC
74LVC1G04GV	V04
74LVC1G04GM	VC
74LVC1G04GN	VC
74LVC1G04GS	VC
74LVC1G04GX	VC
74LVC1G04GX4	VC
74LVC1G04GZ	VC

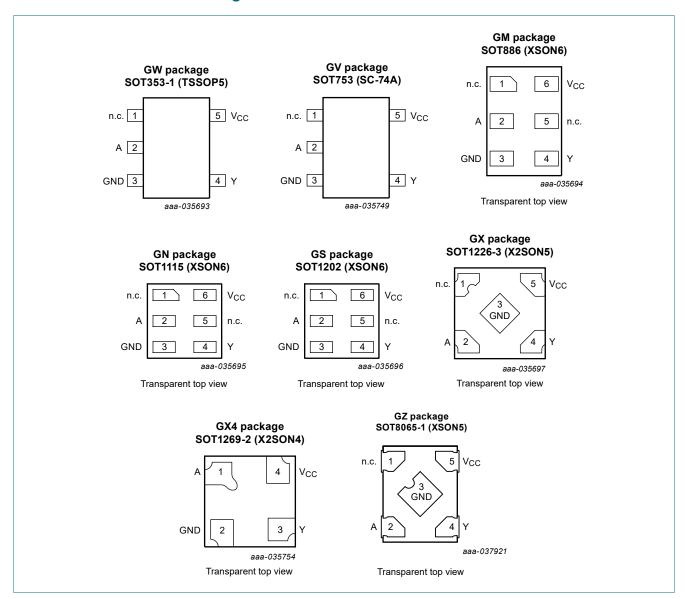
<sup>[1]</sup> The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



# 6. Pinning information

### 6.1. Pinning



### 6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description		
	TSSOP5, SC-74A, XSON5 and X2SON5	A, XSON5 and X2SON5 XSON6 X2SON4		
n.c.	1	1, 5	-	not connected
Α	2	2	1	data input
GND	3	3	2	ground (0 V)
Υ	4	4	3	data output
V <sub>CC</sub>	5	6	4	supply voltage

### 7. Functional description

#### **Table 4. Function table**

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level.$ 

Input	Output
A	Υ
L	Н
Н	L

### 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 <sub>CC</sub>	supply voltage			-0.5	+6.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V		-50	-	mA
VI	input voltage		[1]	-0.5	+6.5	V
I <sub>OK</sub>	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V		-	±50	mA
Vo	output voltage	Active mode	[1]	-0.5	V <sub>CC</sub> + 0.5	V
		Power-down mode; V <sub>CC</sub> = 0 V	[1]	-0.5	+6.5	V
Io	output current	$V_O = 0$ to $V_{CC}$		-	±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				
		SOT353-1 (TSSOP5) SOT753 (SC-74A) SOT886 (XSON6) SOT1115 (XSON6) SOT1202 (XSON6) SOT1226-3 (X2SON5) SOT8065-1 (XSON5)	[2]	-	250	mW
		SOT1269-2 (X2SON4)	[3]	-	150	mW

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

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

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

For SOT886 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74  $^{\circ}\text{C}.$ 

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

For SOT8065-1 (XSON5) package: P<sub>tot</sub> derates linearly with 3.2 mW/K above 72 °C.

<sup>[3]</sup> For SOT1269-2 (X2SON4) package:  $P_{tot}$  derates linearly with 1.7 mW/K above 57 °C.

# 9. Recommended operating conditions

Table 6. 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	-	V <sub>CC</sub>	Vo
		Power-down mode; V <sub>CC</sub> = 0 V	0	-	5.5	Vo
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.65 V to 2.7 V	-	-	20	ns/V
		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[1]	Max	Unit
T <sub>amb</sub> = -4	10 °C to +85 °C					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		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 × V <sub>CC</sub>	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	٧
		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 × V <sub>CC</sub>	V
V <sub>OH</sub>	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	٧
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.3	-	-	٧
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.8	-	-	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	0.1	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	-	-	0.3	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	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 <sub>CC</sub> = 0 V to 5.5 V; V <sub>I</sub> = 5.5 V or GND	-	±0.1	±1	μΑ
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V	-	±0.1	±2	μΑ
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A	-	0.1	4	μΑ

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Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
ΔI <sub>CC</sub>	additional supply current	per pin; $V_{CC} = 2.3 \text{ V to } 5.5 \text{ V};$ $V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}$	-	5	500	μΑ
Cı	input capacitance	$V_{CC}$ = 3.3 V; $V_{I}$ = GND to $V_{CC}$	-	5	-	pF
T <sub>amb</sub> = -4	0 °C to +125 °C	,			1	•
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		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 × V <sub>CC</sub>	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		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 × V <sub>CC</sub>	V
V <sub>OH</sub>	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	0.95	-	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.7	-	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	1.9	-	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.0	-	-	V
		I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V	3.4	-	-	V
V <sub>OL</sub>	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V	-	-	0.1	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
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 0 V to 5.5 V; V <sub>I</sub> = 5.5 V or GND	-	-	±1	μΑ
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V	-	-	±2	μΑ
I <sub>CC</sub>	supply current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 1.65 V to 5.5 V; I <sub>O</sub> = 0 A	-	-	4	μΑ
ΔI <sub>CC</sub>	additional supply current	per pin; V <sub>CC</sub> = 2.3 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	-	500	μΑ

<sup>[1]</sup> All typical values are measured at  $V_{CC}$  = 3.3 V and  $T_{amb}$  = 25  $^{\circ}C.$ 

# 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	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t <sub>pd</sub>	propagation delay	A to Y; see <u>Fig. 4</u> [2]						
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.0	3.0	7.5	1.0	9.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	2.0	5.0	0.5	6.5	ns
		V <sub>CC</sub> = 2.7 V	0.5	2.3	5.2	0.5	7.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.5	2.0	4.2	0.5	5.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.5	1.6	3.7	0.5	5.0	ns
C <sub>PD</sub>	power dissipation capacitance	$V_{I} = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V} [3]$	-	14	-	-	-	pF

- 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.
- $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).

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

f<sub>i</sub> = input frequency in MHz;

 $f_o$  = output frequency in MHz;

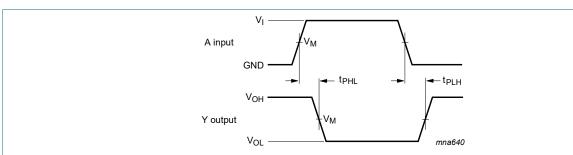
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = 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. Waveform and test circuit



Measurement points are given in Table 9.

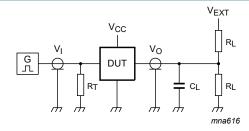
V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

The input A to output Y propagation delays Fig. 4.

**Table 9. Measurement points** 

Supply voltage	Input	Output
V <sub>CC</sub>	V <sub>M</sub>	V <sub>M</sub>
1.65 V to 1.95 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
2.3 V to 2.7 V	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>
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	0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>

#### Single inverter



Test data is given in Table 10.

Definitions for test circuit:

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

 $C_L$  = Load capacitance including jig and probe capacitance;

R<sub>T</sub> = Termination resistance should be equal to the output impedance Z<sub>o</sub> of the pulse generator;

 $V_{\text{EXT}}$  = 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	R <sub>L</sub>	t <sub>PLH</sub> , t <sub>PHL</sub>
1.65 V to 1.95 V	V <sub>CC</sub>	≤ 2.0 ns	30 pF	1 kΩ	open
2.3 V to 2.7 V	V <sub>CC</sub>	≤ 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 <sub>CC</sub>	≤ 2.5 ns	50 pF	500 Ω	open

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Single inverter

# 12. Package outline

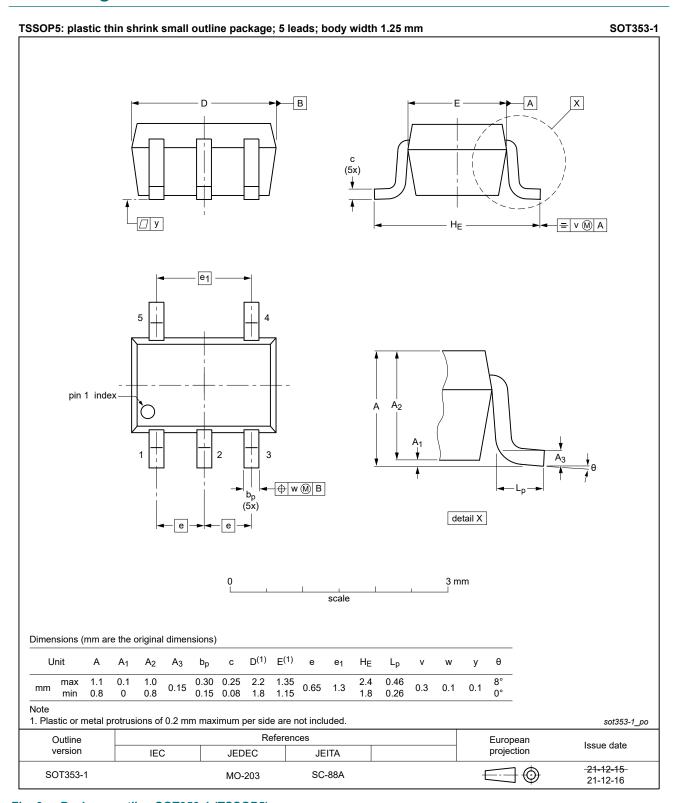


Fig. 6. Package outline SOT353-1 (TSSOP5)

Single inverter

74LVC1G04



**SOT753** 

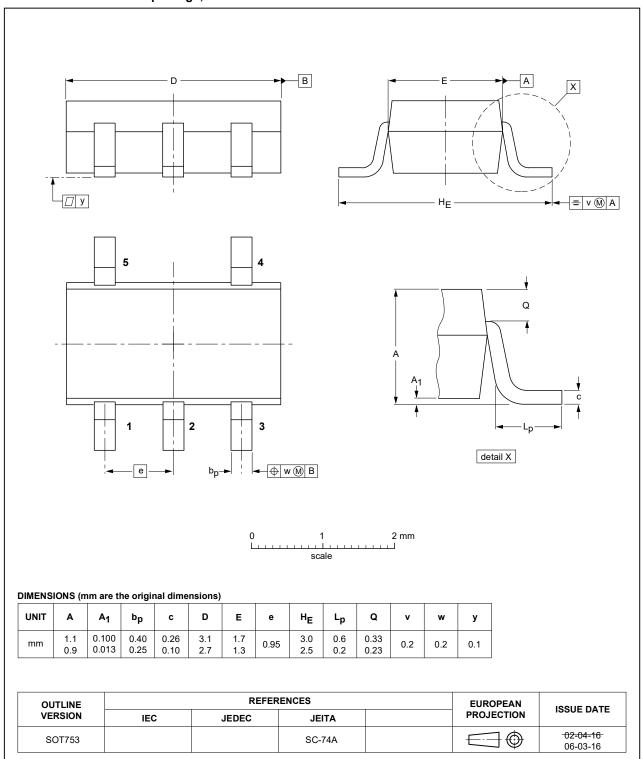


Fig. 7. Package outline SOT753 (SC-74A)

### Single inverter

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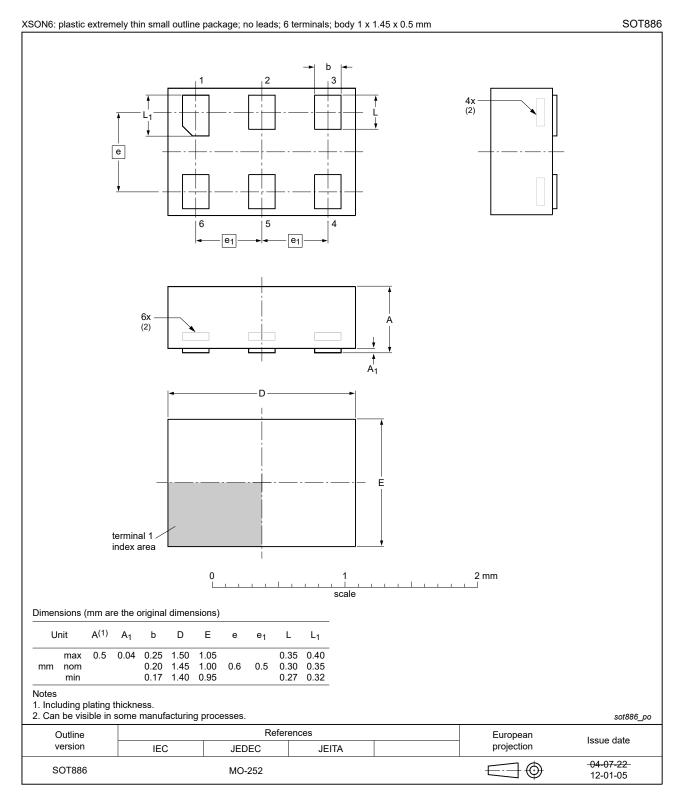


Fig. 8. Package outline SOT886 (XSON6)

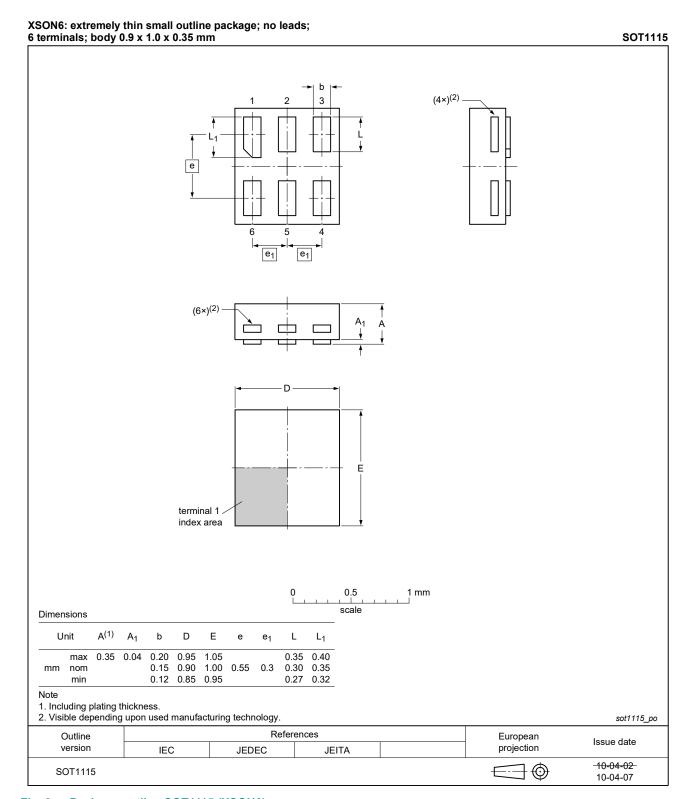


Fig. 9. Package outline SOT1115 (XSON6)

Single inverter

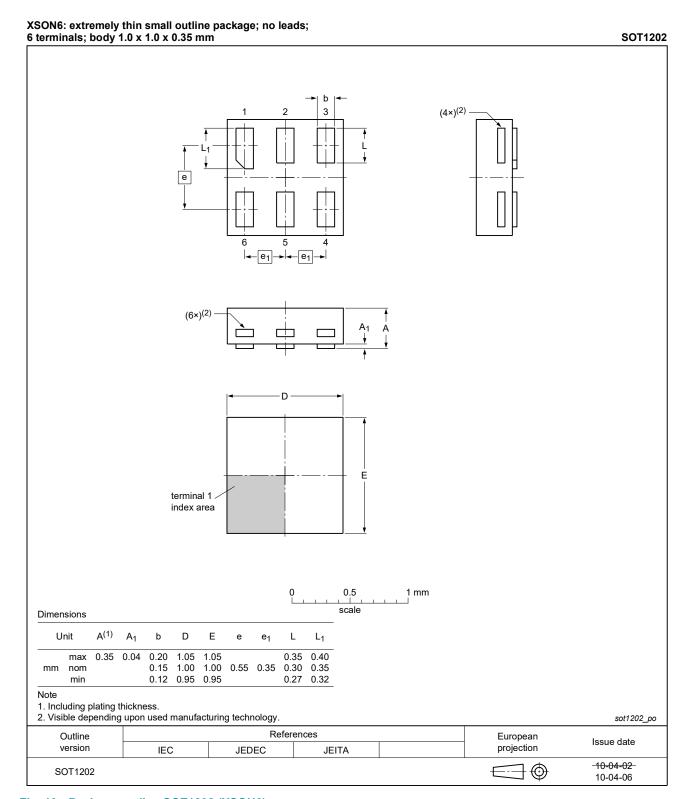


Fig. 10. Package outline SOT1202 (XSON6)

**Product data sheet** 

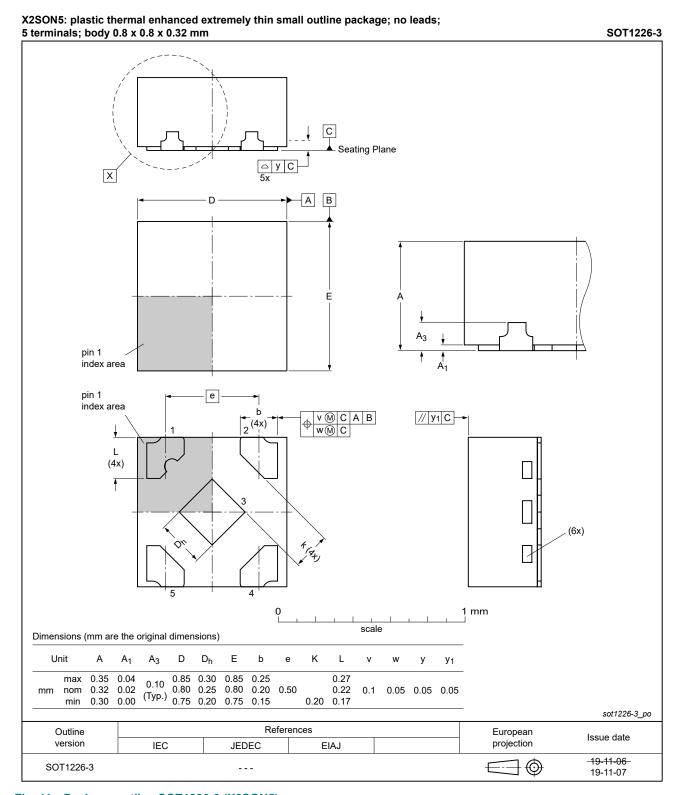


Fig. 11. Package outline SOT1226-3 (X2SON5)

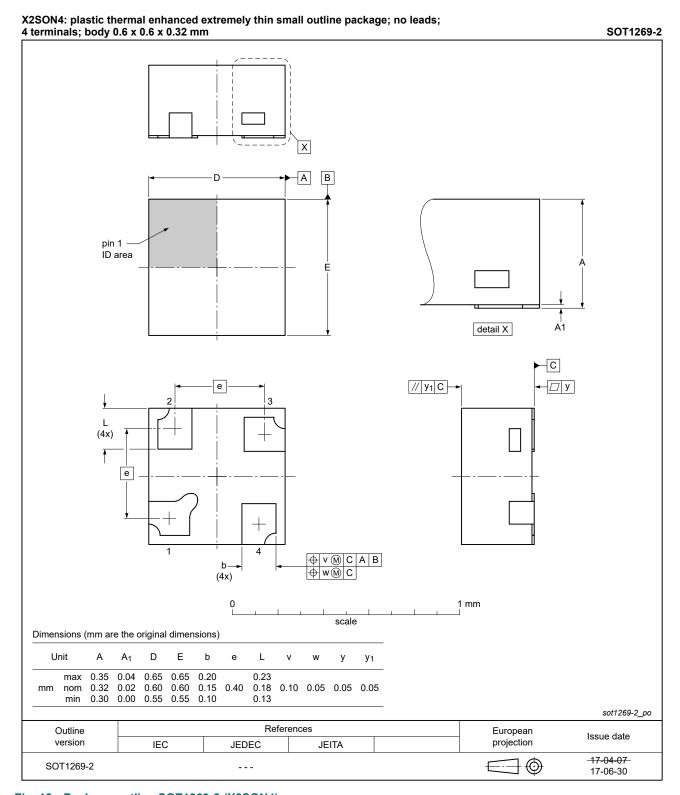


Fig. 12. Package outline SOT1269-2 (X2SON4)

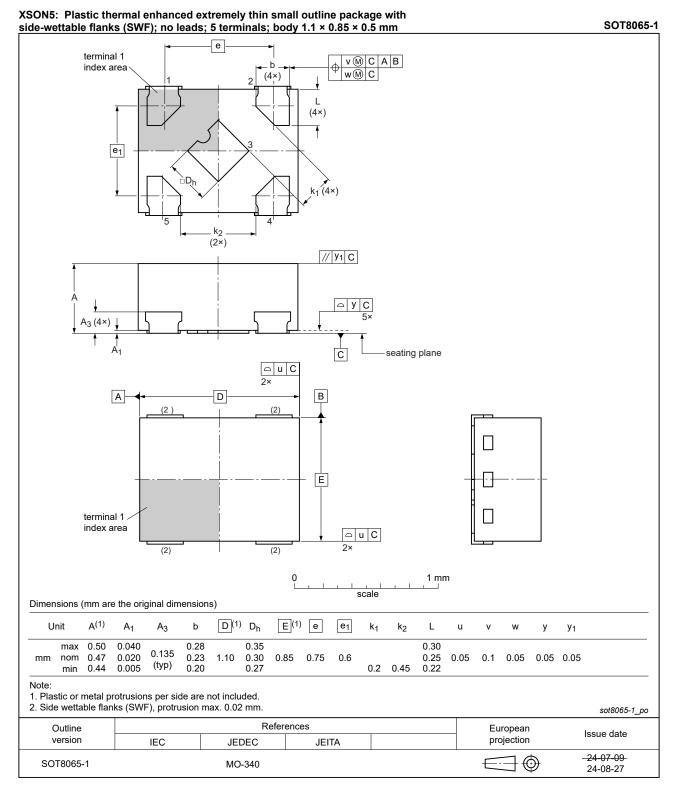


Fig. 13. Package outline SOT8065-1 (XSON5)

### 13. Abbreviations

#### **Table 11. Abbreviations**

Acronym	Description
ANSI	American National Standards Institute
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
НВМ	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

# 14. Revision history

#### Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G04 v.18.1	20240902	Product data sheet	-	74LVC1G04 v.18
Modifications:	• Fig. 13: Add	ded JEDEC reference M	O-340 to SOT8065-	1 package outline drawing.
74LVC1G04 v.18	20240711	Product data sheet	-	74LVC1G04 v.17
Modifications:	Type number	er 74LVC1G04GZ (SOT	8065-1/XSON5) add	led.
74LVC1G04 v.17	20230804	Product data sheet	-	74LVC1G04 v.16
Modifications:	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.			
74LVC1G04 v.16	20220209	Product data sheet	-	74LVC1G04 v.15
	<ul><li>Fig. 6: Pack</li><li>Type numb</li><li>Table 5: De</li></ul>	X2SON5) package chan kage outline drawing for er 74LVC1G04GF (SOT rating values for P <sub>tot</sub> tota nd <u>Section 2</u> updated.	SOT353-1 (TSSOP5 891/XSON6) remove	5) package has changed. ed.
74LVC1G04 v.15	20180608	Product data sheet	-	74LVC1G04 v.14
Modifications:	Added type	number 74LVC1G04GX	(4 (SOT1269-2)	
74LVC1G04 v.14	20171101	Product data sheet	-	74LVC1G04 v.13
Modifications:	guidelines o	of this data sheet has be of Nexperia. have been adapted to th	-	
74LVC1G04 v.13	20161128	Product data sheet	-	74LVC1G04 v.12
Modifications:	• <u>Table 7</u> : The	e maximum limits for lea	kage current and su	pply current have changed.
74LVC1G04 v.12	20120806	Product data sheet	-	74LVC1G04 v.11
Modifications:	• Package ou	ıtline drawing of SOT122	26 modified.	
74LVC1G04 v.11	20120412	Product data sheet	-	74LVC1G04 v.10
Modifications:		number 74LVC1G04GX	,	
74LVC1G04 v.10	20111207	Product data sheet	-	74LVC1G04 v.9
Modifications:	Legal page	s updated.		

### 15. Legal information

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Document status [1][2]	Product status [3]	Definition
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Product [short] data sheet	Production	This document contains the product specification.

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