

74LVC2G240-Q100

Dual inverting buffer/line driver; 3-state

Rev. 5 — 21 August 2023

Product data sheet

1. General description

The 74LVC2G240-Q100 is a dual inverting buffer/line driver with 3-state outputs. The output enable inputs $1\overline{OE}$ and $2\overline{OE}$, control the 3-state outputs. A HIGH level at pins $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of the 74LVC2G240-Q100 as a translator in a mixed 3.3 V and 5 V environment.

It is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 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:
- ± 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
 - 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: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G240DP-Q100	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC2G240DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1

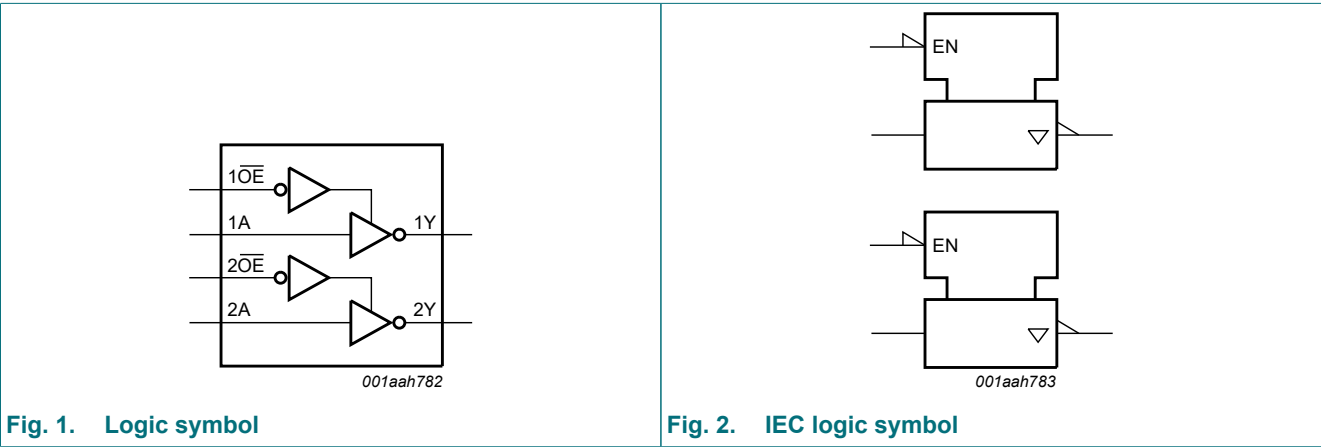
4. Marking

Table 2. Marking codes

Type number	Marking code [1]
74LVC2G240DP-Q100	V240
74LVC2G240DC-Q100	V40

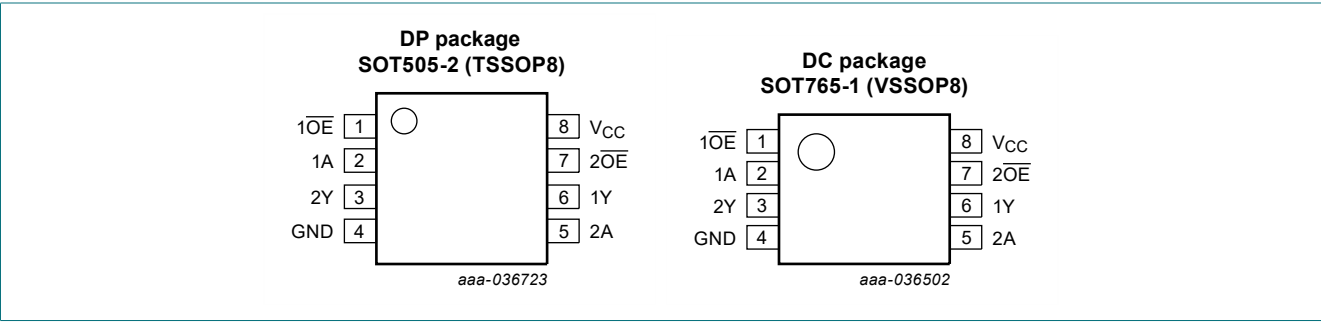
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1OE	1	output enable input 1OE (active LOW)
1A	2	data input
2Y	3	data output
GND	4	ground (0 V)
2A	5	data input
1Y	6	data output
2OE	7	output enable input 2OE (active LOW)
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Input		Output
nOE	nA	nY
L	L	H
L	H	L
H	X	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	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	[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V	-	±50	mA
V _O	output voltage	Enable mode [1]	-0.5	V _{CC} + 0.5	V
		Disable mode [1]	-0.5	+6.5	V
		Power-down mode; V _{CC} = 0 V [1]	-0.5	+6.5	V
I _O	output current	V _O = 0 V to V _{CC}	-	±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 °C to +125 °C [2]	-	250	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.
For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.

9. Recommended operating conditions

Table 6. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.65	5.5	V
V_I	input voltage		0	5.5	V
V_O	output voltage	$V_{CC} = 1.65\text{ V to } 5.5\text{ V}$; Enable mode	0	V_{CC}	V
		$V_{CC} = 1.65\text{ V to } 5.5\text{ V}$; Disable mode	0	5.5	V
		$V_{CC} = 0\text{ V}$; Power-down mode	0	5.5	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65\text{ V to } 2.7\text{ V}$	-	20	ns/V
		$V_{CC} = 2.7\text{ V to } 5.5\text{ V}$	-	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	$T_{amb} = -40\text{ °C to } +85\text{ °C}$			$T_{amb} = -40\text{ °C to } +125\text{ °C}$		Unit
			Min	Typ [1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$V_{CC} = 1.65\text{ V to } 1.95\text{ V}$	$0.65 \times V_{CC}$	-	-	$0.65 \times V_{CC}$	-	V
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	1.7	-	-	1.7	-	V
		$V_{CC} = 2.7\text{ V to } 3.6\text{ V}$	2.0	-	-	2.0	-	V
		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	$0.7 \times V_{CC}$	-	-	$0.7 \times V_{CC}$	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.65\text{ V to } 1.95\text{ V}$	-	-	$0.35 \times V_{CC}$	-	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	-	-	0.7	-	0.7	V
		$V_{CC} = 2.7\text{ V to } 3.6\text{ V}$	-	-	0.8	-	0.8	V
		$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$	-	-	$0.3 \times V_{CC}$	-	$0.3 \times V_{CC}$	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}\text{ or } V_{IL}$						
		$I_O = 100\text{ }\mu\text{A}$; $V_{CC} = 1.65\text{ V to } 5.5\text{ V}$	-	-	0.1	-	0.1	V
		$I_O = 4\text{ mA}$; $V_{CC} = 1.65\text{ V}$	-	-	0.45	-	0.70	V
		$I_O = 8\text{ mA}$; $V_{CC} = 2.3\text{ V}$	-	-	0.3	-	0.45	V
		$I_O = 12\text{ mA}$; $V_{CC} = 2.7\text{ V}$	-	-	0.4	-	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
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}\text{ or } V_{IL}$				-	-	
		$I_O = -100\text{ }\mu\text{A}$; $V_{CC} = 1.65\text{ V to } 5.5\text{ V}$	$V_{CC} - 0.1$	-	-	$V_{CC} - 0.1$	-	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

Symbol	Parameter	Conditions	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	µA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = 5.5 V or GND; V _{CC} = 3.6 V	-	±0.1	±2	-	±2	µA
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 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 _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V	-	5	500	-	500	µA
C _I	input capacitance		-	2	-	-	-	pF

[1] 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 test circuit see Fig. 5.

Symbol	Parameter	Conditions	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Fig. 3 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	4.1	9.5	1.0	11.9	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	2.6	5.2	0.5	6.5	ns
		V _{CC} = 2.7 V	1.0	3.0	5.5	1.0	6.9	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.5	4.6	0.5	5.8	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	2.0	4.0	0.5	5.0	ns
t _{en}	enable time	nOE to nY; see Fig. 4 [3]						
		V _{CC} = 1.65 V to 1.95 V	1.5	4.5	10.3	1.5	12.9	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	2.9	5.6	1.0	7.0	ns
		V _{CC} = 2.7 V	1.5	3.4	5.6	1.5	7.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.5	4.7	0.5	5.9	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	2.0	3.8	0.5	4.8	ns
t _{dis}	disable time	nOE to nY; see Fig. 4 [4]						
		V _{CC} = 1.65 V to 1.95 V	1.0	3.5	11.6	1.0	14.1	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	1.9	5.8	0.5	7.6	ns
		V _{CC} = 2.7 V	1.0	2.8	4.5	1.0	5.8	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.7	4.4	1.0	5.7	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	1.9	3.4	0.5	4.6	ns

Symbol	Parameter	Conditions	T _{amb} = -40 °C to +85 °C			T _{amb} = -40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} [5]						
		output enabled	-	18	-	-	-	pF
		output disabled	-	5	-	-	-	pF

- [1] Typical values are measured at nominal V_{CC} and at T_{amb} = 25 °C.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}
- [3] t_{en} is the same as t_{PZH} and t_{PZL}
- [4] t_{dis} is the same as t_{PLZ} and t_{PHZ}
- [5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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;
Σ(C_L × V_{CC}² × f_o) = sum of outputs.

11.1. Waveforms and test circuit

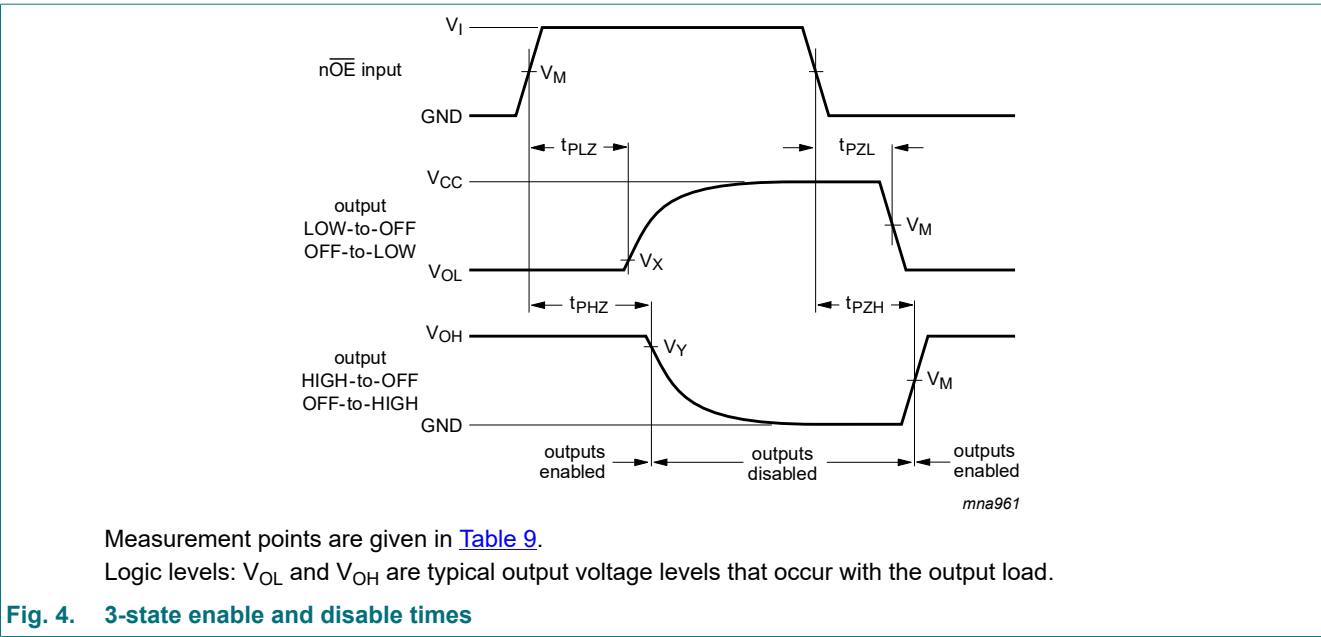
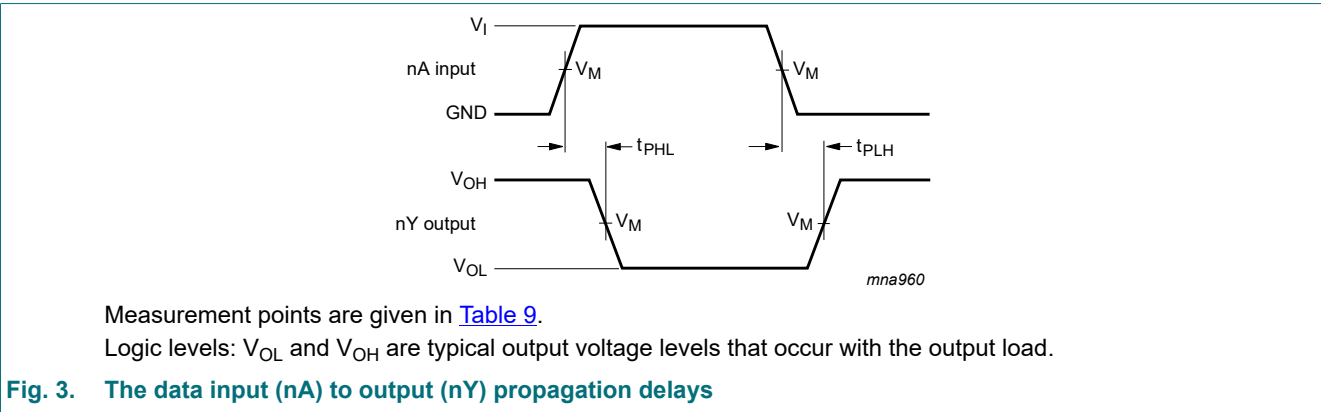
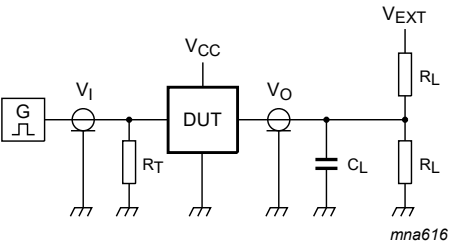


Table 9. Measurement points

Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	V _Y
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V
2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V
4.5 V to 5.5 V	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.3 V	V _{OH} - 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_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 _{EXT}		
V _{CC}	V _I	C _L	R _L	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
1.65 V to 1.95 V	V _{CC}	30 pF	1 kΩ	open	GND	2 × V _{CC}
2.3 V to 2.7 V	V _{CC}	30 pF	500 Ω	open	GND	2 × V _{CC}
2.7 V	2.7 V	50 pF	500 Ω	open	GND	6 V
3.0 V to 3.6 V	2.7 V	50 pF	500 Ω	open	GND	6 V
4.5 V to 5.5 V	V _{CC}	50 pF	500 Ω	open	GND	2 × V _{CC}

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

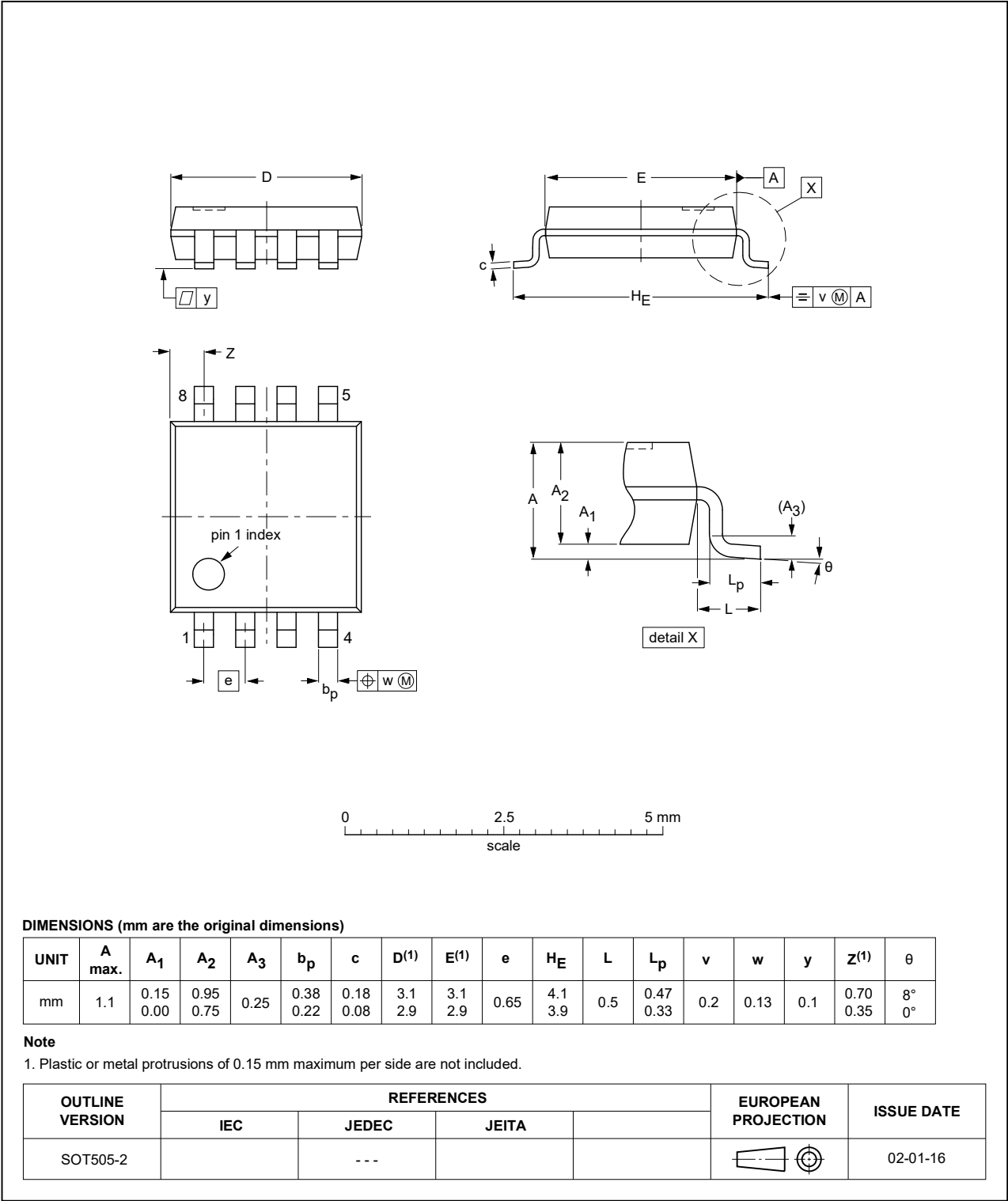


Fig. 6. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

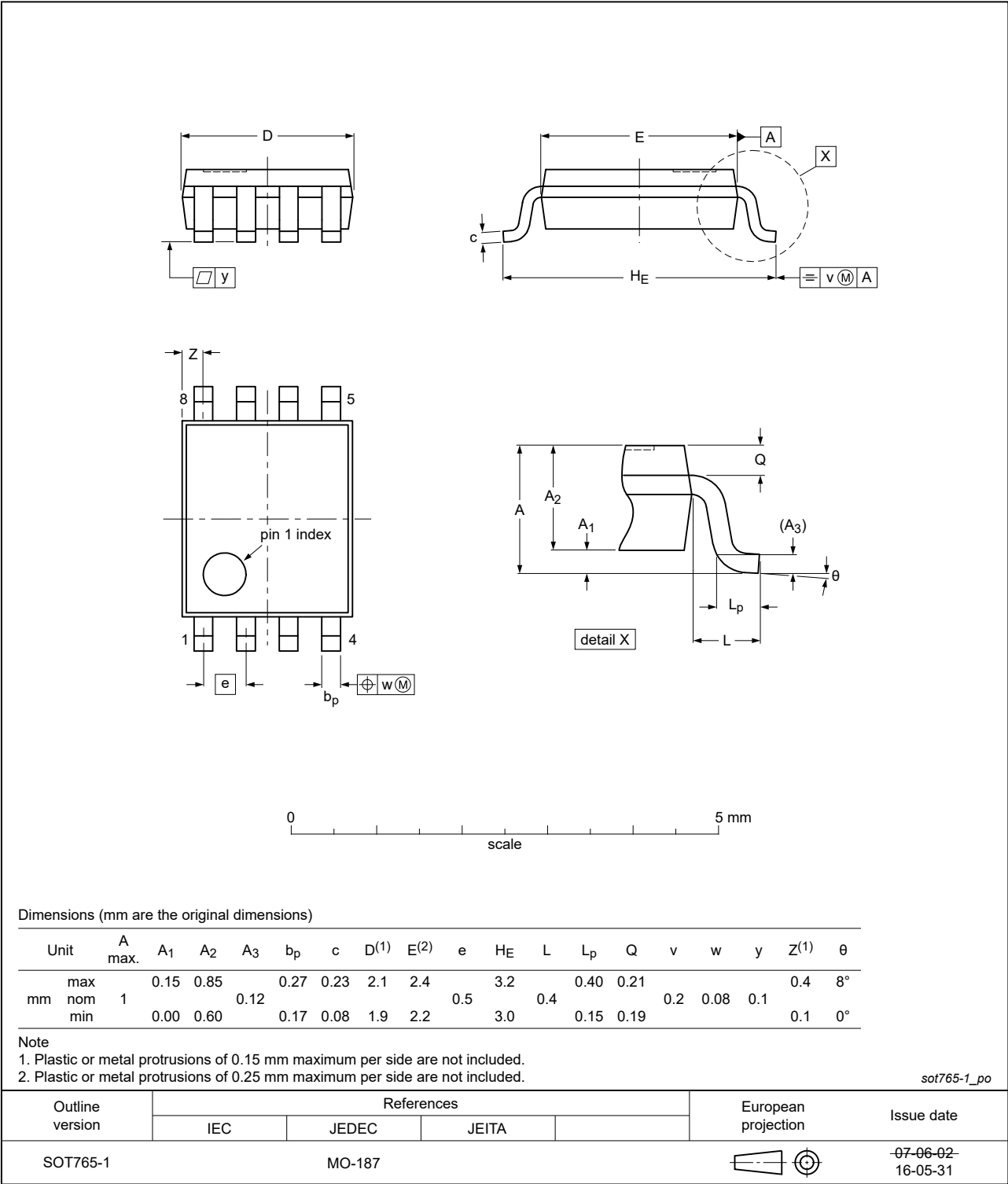


Fig. 7. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 11. Abbreviations

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

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G240_Q100 v.5	20230821	Product data sheet	-	74LVC2G240_Q100 v.4
Modifications:	Section 2: ESD specification updated according to the latest JEDEC standard.			
74LVC2G240_Q100 v.4	20230601	Product data sheet	-	74LVC2G240_Q100 v.3
Modifications:	Section 8: Derating values for P_{tot} total power dissipation updated.			
74LVC2G240_Q100 v.3	20181101	Product data sheet	-	74LVC2G240_Q100 v.2
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.			
74LVC2G240_Q100 v.2	20161214	Product data sheet	-	74LVC2G240_Q100 v.1
Modifications:	Table 7: The maximum limits for leakage current and supply current have changed.			
74LVC2G240_Q100 v.1	20141015	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.

- [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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