

74LVC1G80-Q100

Single D-type flip-flop; positive-edge trigger

Rev. 5 — 12 November 2024

Product data sheet

1. General description

The 74LVC1G80-Q100 is a single positive-edge triggered D-type flip-flop. Data at the D-input that meets the set-up and hold time requirements on the LOW-to-HIGH clock transition will be stored in the flip-flop and its complement will appear at the \bar{Q} output. 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.

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 -40 °C to +125 °C
- 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 ($V_{CC} = 3.0$ V)
- CMOS low power dissipation
- Direct interface with TTL levels
- I_{OFF} 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

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G80GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74LVC1G80GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753

Type number	Package			
	Temperature range	Name	Description	Version
74LVC1G80GZ-Q100	-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 codes

Type number	Marking[1]
74LVC1G80GW-Q100	VT
74LVC1G80GV-Q100	V80
74LVC1G80GZ-Q100	VT

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

5. Functional diagram

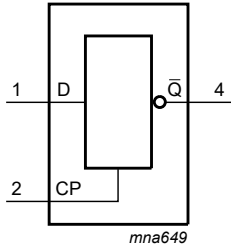


Fig. 1. Logic symbol

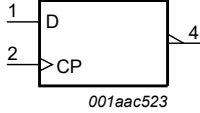


Fig. 2. IEC logic symbol

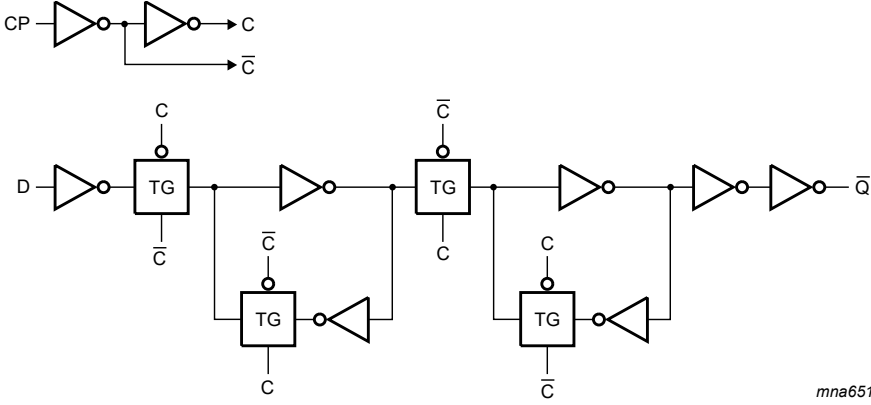
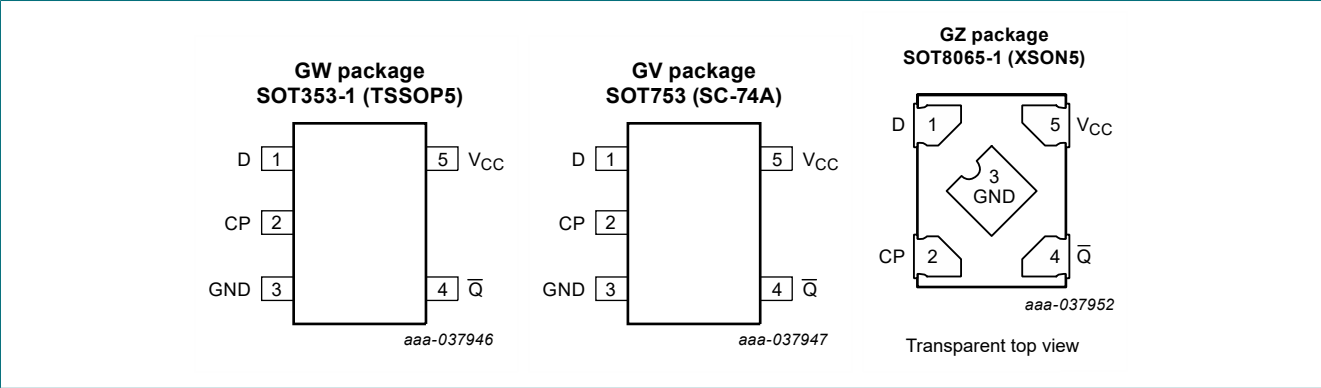


Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
D	1	data input
CP	2	clock pulse input
GND	3	ground (0 V)
Q̄	4	data output
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; ↑ = LOW-to-HIGH CP transition; X = don't care;
q̄ = lower case letter indicates the state of referenced input, one set-up time prior to the LOW-to-HIGH CP transition.

Input		Output
CP	D	Q̄
↑	L	H
↑	H	L
L	X	q̄

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		-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	Active mode	-0.5	V _{CC} + 0.5	V
		Power-down mode; V _{CC} = 0 V	-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
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C	-	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] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.
For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.
For SOT8065-1 (XSON5) package: P_{tot} derates linearly with 3.2 mW/K above 72 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CC}	supply voltage		1.65	-	5.5	V
V _I	input voltage		0	-	5.5	V
V _O	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

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 _{amb} = -40 °C to +85 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = -100 µA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	-	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.8	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 100 µA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	µA
I _{OFF}	power-off leakage current	V _{CC} = 0 V; V _I or V _O = 5.5 V	-	±0.1	±2	µA
I _{CC}	supply current	V _I = 5.5 V or GND; V _{CC} = 1.65 V to 5.5 V; I _O = 0 A	-	0.1	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	µA
C _I	input capacitance	V _{CC} = 3.3 V; V _I = GND to V _{CC}	-	5	-	pF

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} = -40 °C to +125 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = -100 µA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	0.95	-	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.7	-	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	1.9	-	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.0	-	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.4	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 100 µA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.80	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	±1	µA
I _{OFF}	power-off leakage current	V _{CC} = 0 V; V _I or V _O = 5.5 V	-	-	±2	µA
I _{CC}	supply current	V _I = 5.5 V or GND; V _{CC} = 1.65 V to 5.5 V; I _O = 0 A	-	-	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	-	-	500	µA

[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 test circuit see Fig. 6.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	CP to \bar{Q} ; see Fig. 4 [2]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.0	3.4	9.9	1.0	13.0	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	0.5	2.3	7.0	0.5	9.0	ns
		$V_{CC} = 2.7 \text{ V}$	0.5	2.5	6.0	0.5	8.0	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	0.9	2.4	5.0	0.9	6.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	0.5	1.8	4.5	0.5	6.0	ns
t_{su}	set-up time	HIGH or LOW; D to CP; see Fig. 5 [3]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.3	0.8	-	2.3	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.5	0.6	-	1.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	1.5	0.5	-	1.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.3	0.4	-	1.3	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.1	0.5	-	1.1	-	ns
t_h	hold time	D to CP; see Fig. 5						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	0	-0.6	-	0	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	0	-0.4	-	0	-	ns
		$V_{CC} = 2.7 \text{ V}$	+0.5	-0.2	-	0.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	0.9	0.2	-	0.9	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	+0.5	-0.1	-	0.5	-	ns
t_w	pulse width	CP HIGH or LOW; see Fig. 5						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	3.0	1.1	-	3.0	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.5	0.7	-	2.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	2.5	0.6	-	2.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.5	0.6	-	2.5	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	0.5	-	2.0	-	ns
f_{max}	maximum frequency	CP; see Fig. 5						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	160	300	-	160	-	MHz
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	160	350	-	160	-	MHz
		$V_{CC} = 2.7 \text{ V}$	160	350	-	160	-	MHz
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	160	350	-	160	-	MHz
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	200	400	-	200	-	MHz
C_{PD}	power dissipation capacitance	$V_I = \text{GND to } V_{CC}; V_{CC} = 3.3 \text{ V}$ [4]	-	17	-	-	-	pF

[1] Typical values are measured at $T_{amb} = 25 \text{ °C}$ and $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}, 3.3 \text{ V}$ and 5.0 V respectively.

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

[3] t_{su} is the same as $t_{su(H)}$ and $t_{su(L)}$.

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ 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; $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

11.1. Waveforms and test circuit

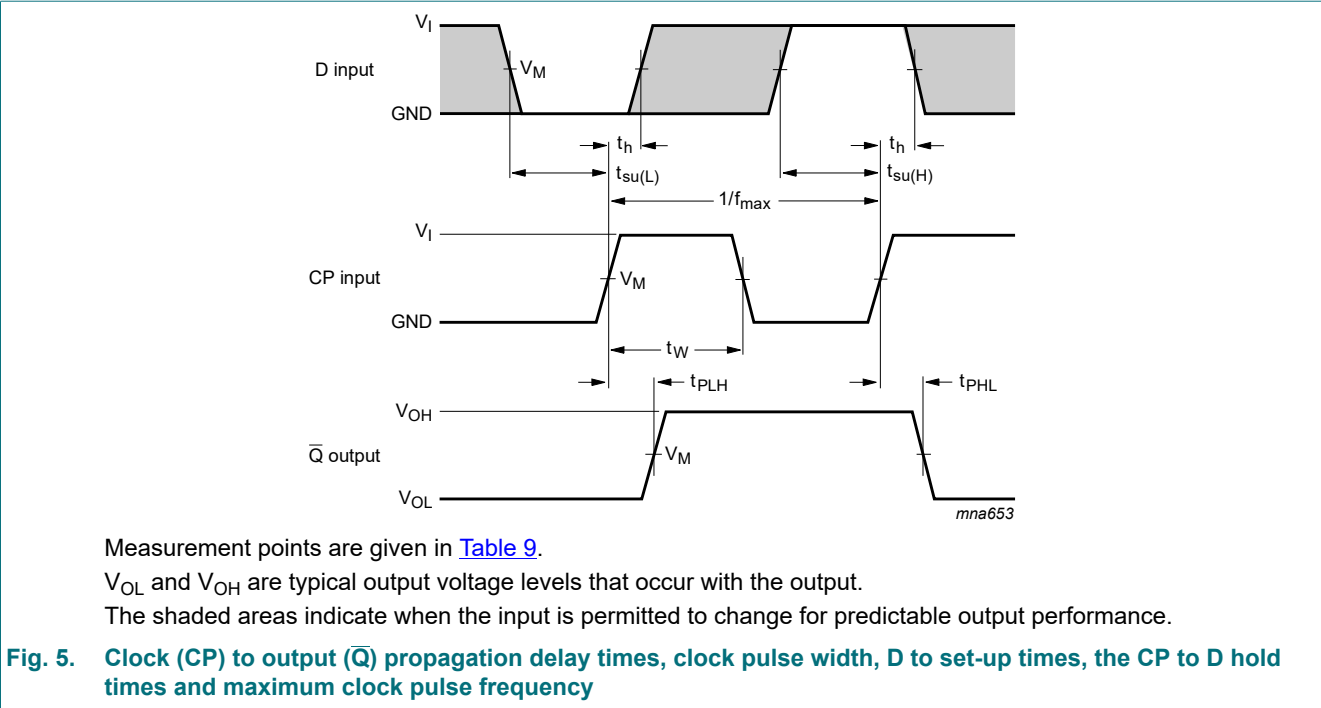
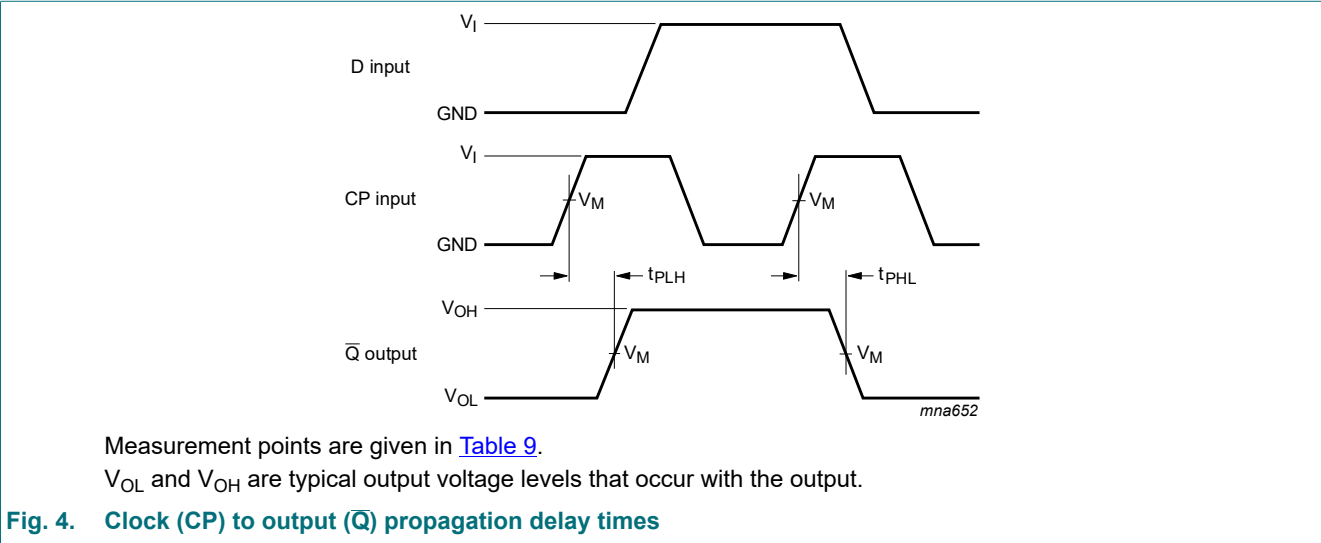
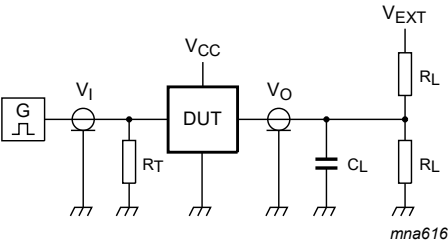


Table 9. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$



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. 6. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V_{EXT}
V_{CC}	V_I	$t_r = t_f$	C_L	R_L	t_{PLH}, t_{PHL}
1.65 V to 1.95 V	V_{CC}	$\leq 2.0 \text{ ns}$	30 pF	1 k Ω	open
2.3 V to 2.7 V	V_{CC}	$\leq 2.0 \text{ ns}$	30 pF	500 Ω	open
2.7 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 Ω	open
3.0 V to 3.6 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 Ω	open
4.5 V to 5.5 V	V_{CC}	$\leq 2.5 \text{ ns}$	50 pF	500 Ω	open

12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

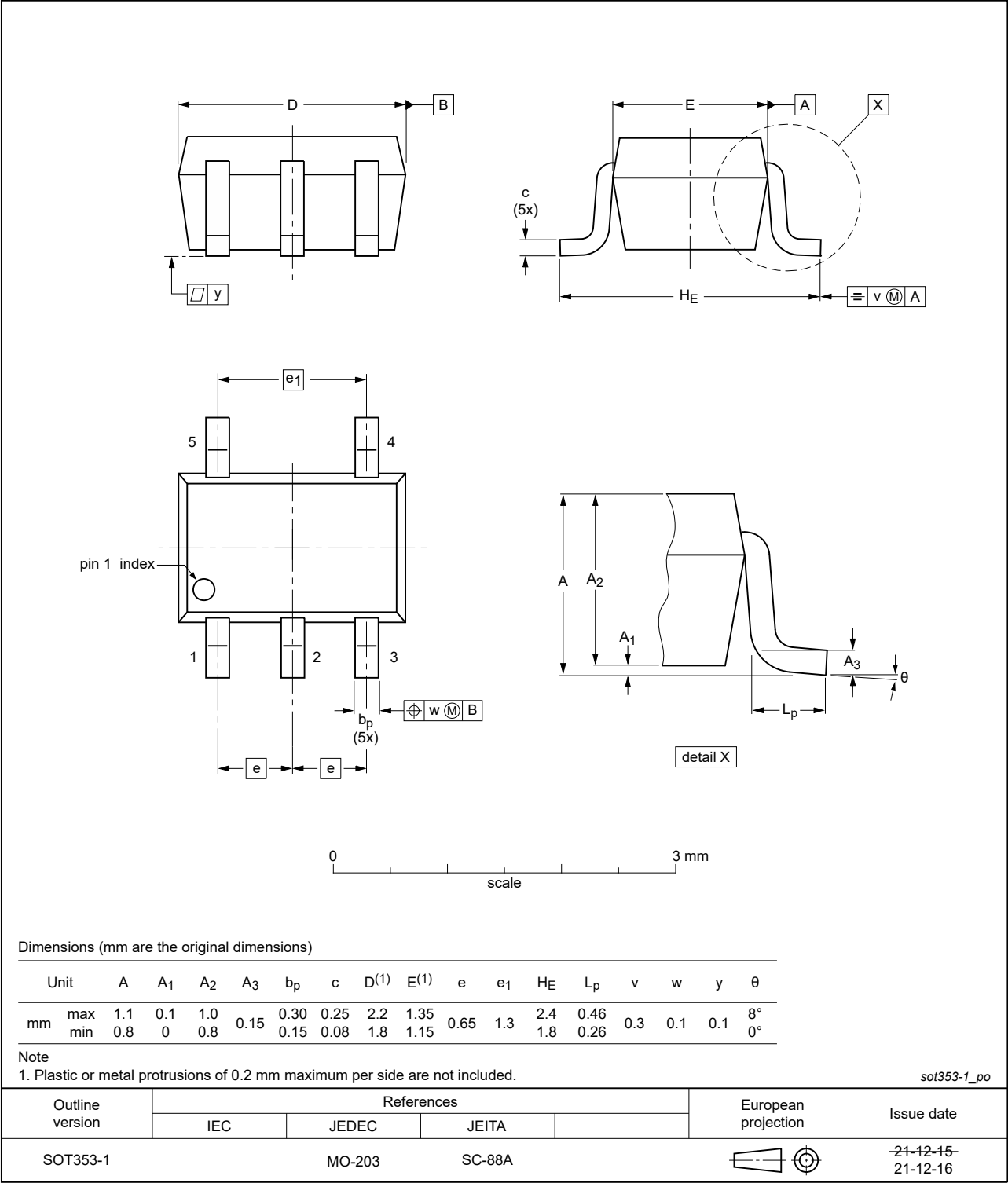
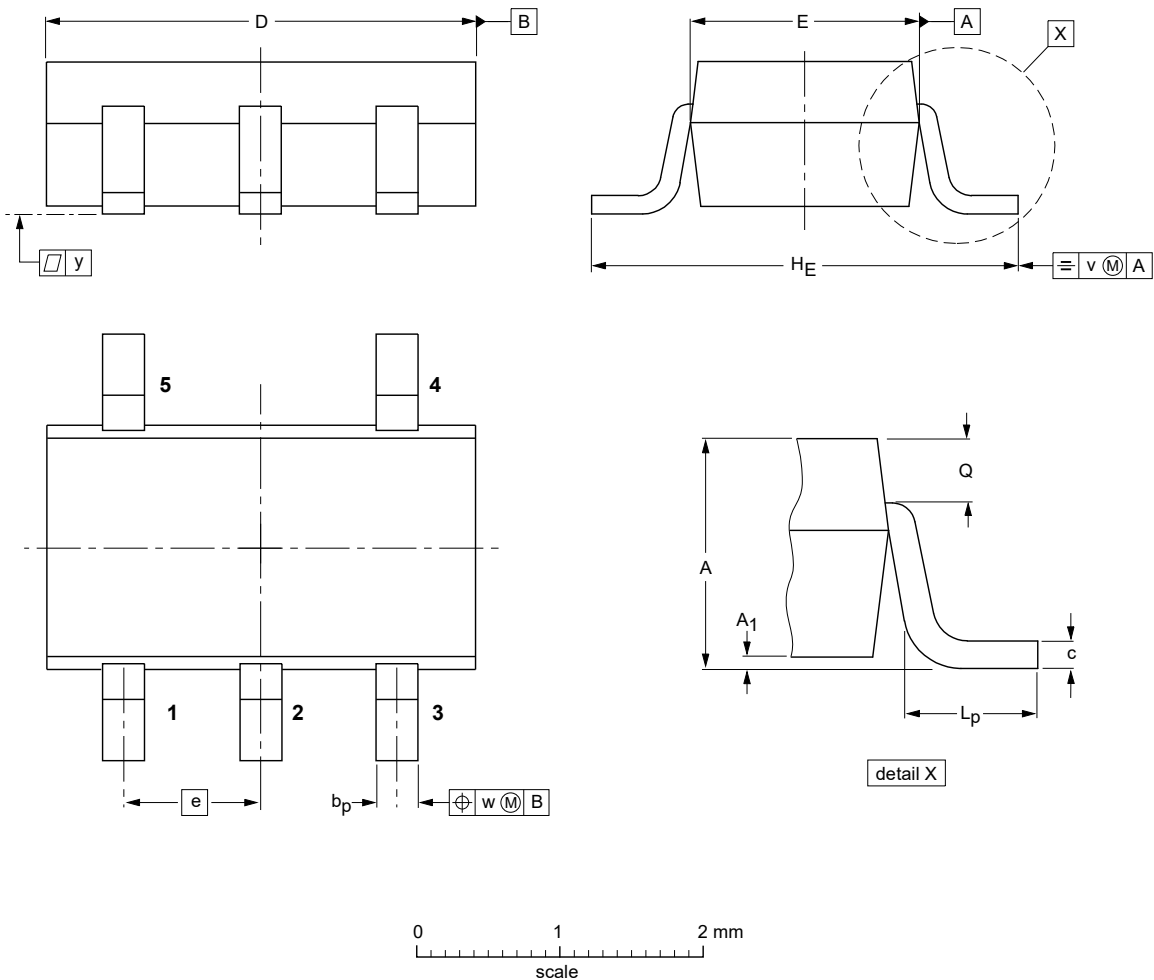


Fig. 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b _p	c	D	E	e	H _E	L _p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

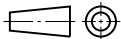
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			02-04-16 06-03-16

Fig. 8. Package outline SOT753 (SC-74A)

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

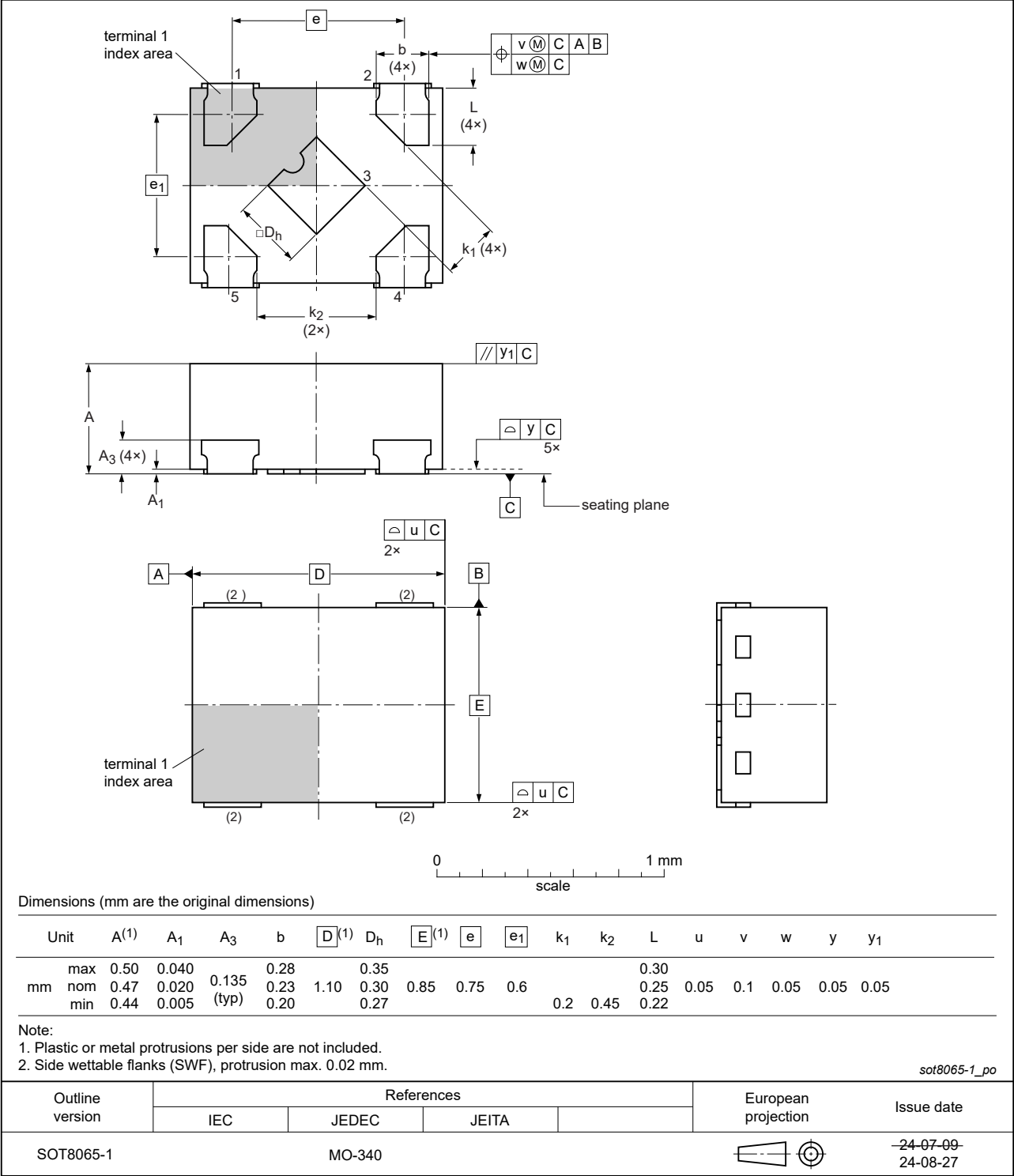


Fig. 9. Package outline SOT8065-1 (XSON5)

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
HBM	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
74LVC1G80_Q100 v.5	20241112	Product data sheet	-	74LVC1G80_Q100 v.4
Modifications:	• Type number 74LVC1G80GZ-Q100 (SOT8065-1/XSON5) added.			
74LVC1G80_Q100 v.4	20230818	Product data sheet	-	74LVC1G80_Q100 v.3
Modifications:	• Section 2 : ESD specification updated according to the latest JEDEC standard.			
74LVC1G80_Q100 v.3	20220131	Product data sheet	-	74LVC1G80_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. • Section 1 and Section 2 updated. • Table 5 : Derating values for P _{tot} total power dissipation updated. • Fig. 7 : Package outline drawing SOT353-1 (TSSOP5) has changed.			
74LVC1G80_Q100 v.2	20161212	Product data sheet	-	74LVC1G80_Q100 v.1
Modifications:	• Table 7 : The maximum limits for leakage current and supply current have changed.			
74LVC1G80_Q100 v.1	20120731	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".
- [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 <https://www.nexperia.com>.

Definitions

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