

74AUP1G07-Q100

Low-power buffer with open-drain output

Rev. 2 — 20 April 2021

Product data sheet

1. General description

The 74AUP1G07-Q100 provides the single non-inverting buffer with open-drain output. The output of the device is an open drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

Schmitt-trigger action at all inputs makes the circuit tolerant to slower input rise and fall times across the entire V_{CC} range from 0.8 V to 3.6 V.

This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 0.8 V to 3.6 V.

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.

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 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
 - JESD8-12 (0.8 V to 1.3 V)
 - JESD8-11 (0.9 V to 1.65 V)
 - JESD8-7 (1.2 V to 1.95 V)
 - JESD8-5 (1.8 V to 2.7 V)
 - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 Class 3A exceeds 5000 V
 - MM: JESD22-A115-A exceeds 200 V
 - MIL-STD-883, method 3015 Class 3A exceeds 5000 V
- Low static power consumption; $I_{CC} = 0.9 \mu\text{A}$ (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- I_{OFF} circuitry provides partial Power-down mode operation

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP1G07GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1

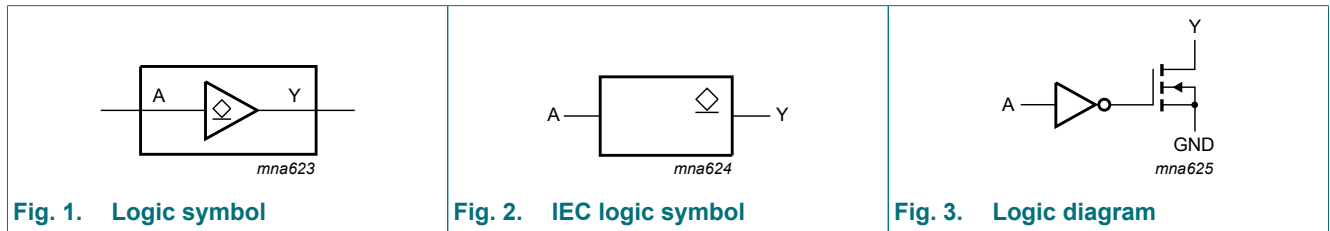
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74AUP1G07GW-Q100	pS

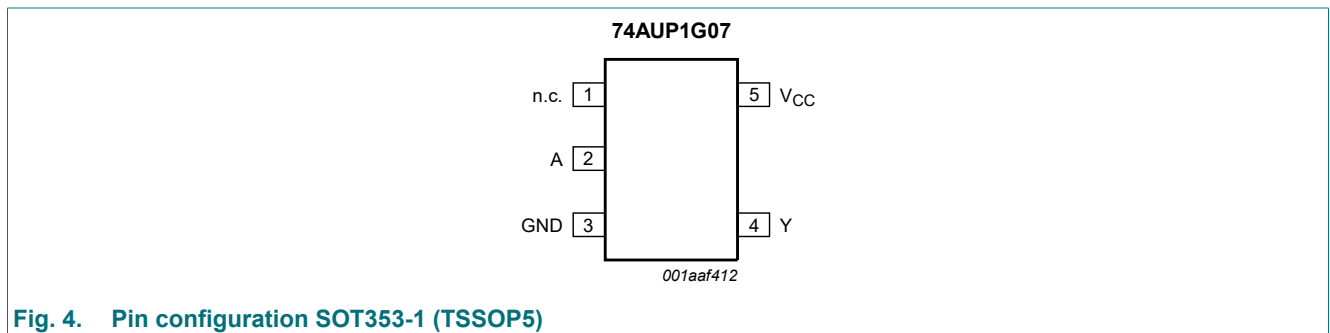
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
n.c.	1	not connected
A	2	data input
GND	3	ground (0 V)
Y	4	data output
V _{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF state.

Input	Output
A	Y
L	L
H	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	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage		[1] -0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode and Power-down mode	[1] -0.5	+4.6	V
I_O	output current	$V_O = 0$ V to V_{CC}	-	20	mA
I_{CC}	supply current		-	50	mA
I_{GND}	ground current		-50	-	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 SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		0.8	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	Active mode and Power-down mode	0	3.6	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 0.8$ V to 3.6 V	0	200	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	Max	Unit
T_{amb} = 25 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	0.70V _{CC}	-	-	V
		V _{CC} = 0.9 V to 1.95 V	0.65V _{CC}	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		V _{CC} = 3.0 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 0.8 V	-	-	0.30V _{CC}	V
		V _{CC} = 0.9 V to 1.95 V	-	-	0.35V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 3.0 V to 3.6 V	-	-	0.9	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V	-	-	0.1	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	0.3V _{CC}	V
		I _O = 1.7 mA; V _{CC} = 1.4 V	-	-	0.31	V
		I _O = 1.9 mA; V _{CC} = 1.65 V	-	-	0.31	V
		I _O = 2.3 mA; V _{CC} = 2.3 V	-	-	0.31	V
		I _O = 3.1 mA; V _{CC} = 2.3 V	-	-	0.44	V
		I _O = 2.7 mA; V _{CC} = 3.0 V	-	-	0.31	V
I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.44	V		
I _I	input leakage current	V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.1	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} ; V _O = 0 V to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.1	μA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±0.2	μA
ΔI _{OFF}	additional power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V	-	-	±0.2	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V	-	-	0.5	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V	-	-	40	μA
C _I	input capacitance	V _{CC} = 0 V to 3.6 V; V _I = GND or V _{CC}	-	0.8	-	pF
C _O	output capacitance	output enabled; V _O = GND; V _{CC} = 0 V	-	1.7	-	pF
		output disabled; V _O = GND; V _{CC} = 0 V	-	1.1	-	pF
T_{amb} = -40 °C to +85 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	0.70V _{CC}	-	-	V
		V _{CC} = 0.9 V to 1.95 V	0.65V _{CC}	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		V _{CC} = 3.0 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 0.8 V	-	-	0.30V _{CC}	V
		V _{CC} = 0.9 V to 1.95 V	-	-	0.35V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 3.0 V to 3.6 V	-	-	0.9	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V	-	-	0.1	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	0.3V _{CC}	V
		I _O = 1.7 mA; V _{CC} = 1.4 V	-	-	0.37	V
		I _O = 1.9 mA; V _{CC} = 1.65 V	-	-	0.35	V
		I _O = 2.3 mA; V _{CC} = 2.3 V	-	-	0.33	V
		I _O = 3.1 mA; V _{CC} = 2.3 V	-	-	0.45	V
		I _O = 2.7 mA; V _{CC} = 3.0 V	-	-	0.33	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.45	V
I _I	input leakage current	V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.5	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} ; V _O = 0 V to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.5	μA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±0.5	μA
ΔI _{OFF}	additional power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V	-	-	±0.6	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V	-	-	0.9	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V	-	-	50	μA
T_{amb} = -40 °C to +125 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	0.75V _{CC}	-	-	V
		V _{CC} = 0.9 V to 1.95 V	0.70V _{CC}	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		V _{CC} = 3.0 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 0.8 V	-	-	0.25V _{CC}	V
		V _{CC} = 0.9 V to 1.95 V	-	-	0.30V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 3.0 V to 3.6 V	-	-	0.9	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V	-	-	0.11	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	0.33V _{CC}	V
		I _O = 1.7 mA; V _{CC} = 1.4 V	-	-	0.41	V
		I _O = 1.9 mA; V _{CC} = 1.65 V	-	-	0.39	V
		I _O = 2.3 mA; V _{CC} = 2.3 V	-	-	0.36	V
		I _O = 3.1 mA; V _{CC} = 2.3 V	-	-	0.50	V
		I _O = 2.7 mA; V _{CC} = 3.0 V	-	-	0.36	V
		I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.50	V
I _I	input leakage current	V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.75	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} ; V _O = 0 V to 3.6 V; V _{CC} = 0 V to 3.6 V	-	-	±0.75	μA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±0.75	μA
ΔI _{OFF}	additional power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V	-	-	±0.75	μA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V	-	-	1.4	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V	-	-	75	μA

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
C_L = 5 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	11.6	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	2.1	4.1	7.5	1.7	9.1	1.7	10.0	ns
		V _{CC} = 1.4 V to 1.6 V	1.6	3.0	5.1	1.3	6.1	1.3	6.7	ns
		V _{CC} = 1.65 V to 1.95 V	1.6	2.7	4.0	1.2	5.0	1.2	5.5	ns
		V _{CC} = 2.3 V to 2.7 V	1.1	2.1	3.2	0.9	4.0	0.9	4.4	ns
C_L = 10 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	14.7	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.0	5.1	9.0	2.4	11.2	2.4	12.3	ns
		V _{CC} = 1.4 V to 1.6 V	2.3	3.8	6.1	2.0	7.4	2.0	8.1	ns
		V _{CC} = 1.65 V to 1.95 V	2.4	3.6	4.8	1.8	6.1	1.8	6.7	ns
		V _{CC} = 2.3 V to 2.7 V	1.7	2.8	3.8	1.3	4.8	1.3	5.3	ns
C_L = 15 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	17.7	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.5	6.1	10.4	3.2	13.1	3.2	14.5	ns
		V _{CC} = 1.4 V to 1.6 V	3.0	4.5	6.8	2.6	8.6	2.6	9.4	ns
		V _{CC} = 1.65 V to 1.95 V	2.8	4.4	6.7	2.2	7.8	2.2	8.6	ns
		V _{CC} = 2.3 V to 2.7 V	2.4	3.4	4.5	1.9	5.3	1.9	5.8	ns
C_L = 30 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	24.6	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	4.8	9.0	15.6	4.3	18.8	4.3	20.7	ns
		V _{CC} = 1.4 V to 1.6 V	4.1	6.7	9.4	3.7	11.8	3.7	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.8	6.8	9.7	3.2	11.0	3.2	12.1	ns
		V _{CC} = 2.3 V to 2.7 V	3.7	5.2	6.7	3.0	7.1	3.0	7.8	ns
C_L = 30 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	24.6	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	4.8	9.0	15.6	4.3	18.8	4.3	20.7	ns
		V _{CC} = 1.4 V to 1.6 V	4.1	6.7	9.4	3.7	11.8	3.7	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.8	6.8	9.7	3.2	11.0	3.2	12.1	ns
		V _{CC} = 2.3 V to 2.7 V	3.7	5.2	6.7	3.0	7.1	3.0	7.8	ns
C_L = 30 pF										
t _{pd}	propagation delay	A to Y; see Fig. 5 [2]								
		V _{CC} = 0.8 V	-	24.6	-	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	4.8	9.0	15.6	4.3	18.8	4.3	20.7	ns
		V _{CC} = 1.4 V to 1.6 V	4.1	6.7	9.4	3.7	11.8	3.7	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.8	6.8	9.7	3.2	11.0	3.2	12.1	ns
		V _{CC} = 2.3 V to 2.7 V	3.7	5.2	6.7	3.0	7.1	3.0	7.8	ns

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
C_L = 5 pF, 10 pF, 15 pF and 30 pF										
C _{PD}	power dissipation capacitance	f _i = 1 MHz; V _I = GND to V _{CC} [3]								
		V _{CC} = 0.8 V	-	0.5	-	-	-	-	-	pF
		V _{CC} = 1.1 V to 1.3 V	-	0.6	-	-	-	-	-	pF
		V _{CC} = 1.4 V to 1.6 V	-	0.6	-	-	-	-	-	pF
		V _{CC} = 1.65 V to 1.95 V	-	0.7	-	-	-	-	-	pF
		V _{CC} = 2.3 V to 2.7 V	-	0.9	-	-	-	-	-	pF
		V _{CC} = 3.0 V to 3.6 V	-	1.2	-	-	-	-	-	pF

[1] All typical values are measured at nominal V_{CC}.

[2] t_{pd} is the same as t_{PZL} and t_{PLZ}.

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

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N \text{ where:}$$

f_i = input frequency in MHz;

V_{CC} = supply voltage in V;

N = number of inputs switching.

11.1. Waveforms and test circuit

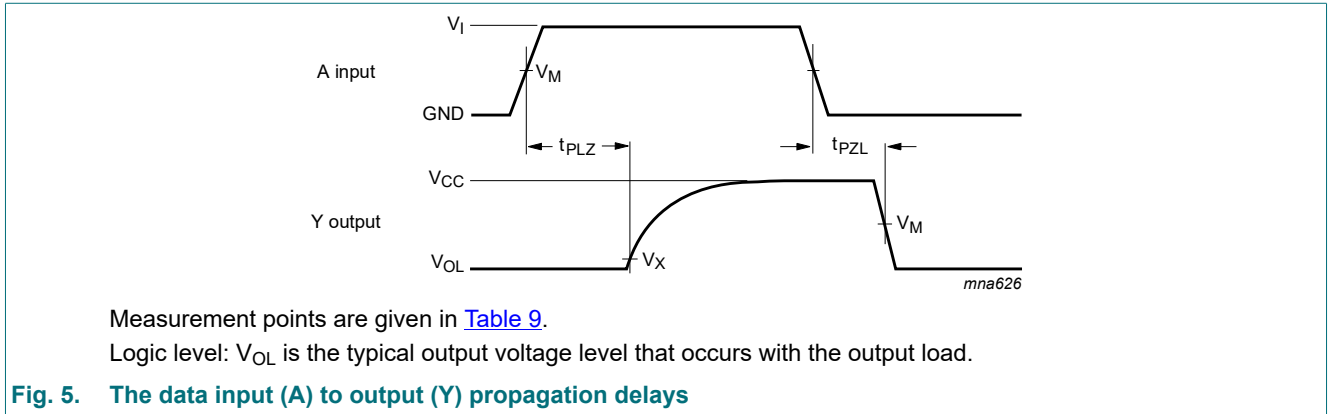


Table 9. Measurement points

Supply voltage	Input			Output	
V_{CC}	V_M	V_I	$t_r = t_f$	V_M	V_X
0.8 V to 1.6 V	$0.5 \times V_{CC}$	V_{CC}	≤ 3.0 ns	$0.5 \times V_{CC}$	$V_{OL} + 0.1$ V
1.65 V to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 3.0 ns	$0.5 \times V_{CC}$	$V_{OL} + 0.15$ V
3.0 V to 3.6 V	$0.5 \times V_{CC}$	V_{CC}	≤ 3.0 ns	$0.5 \times V_{CC}$	$V_{OL} + 0.3$ V

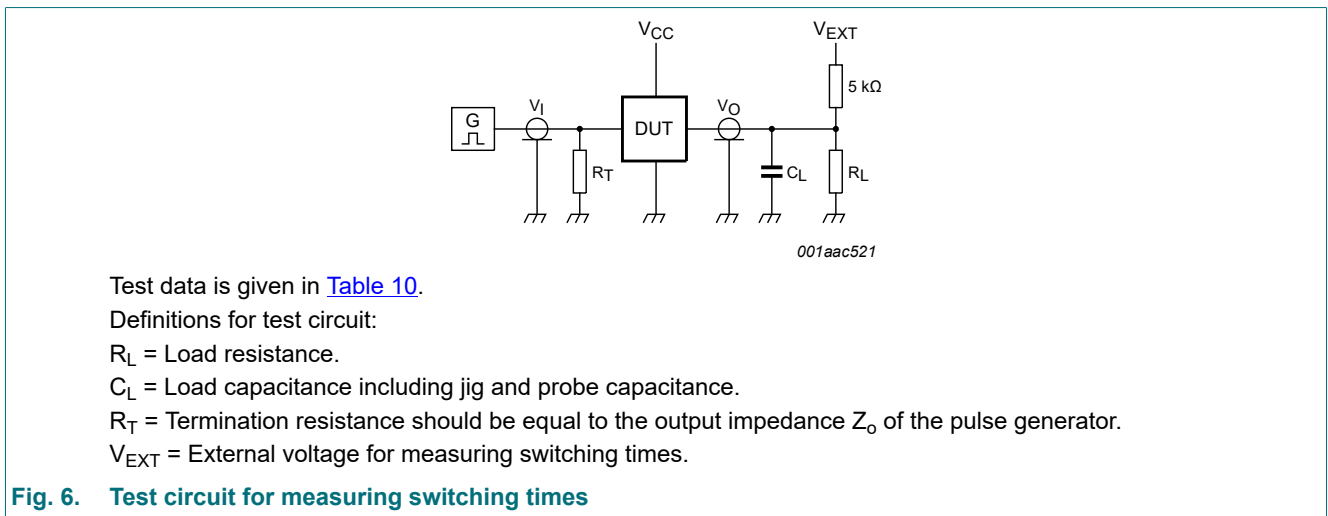


Table 10. Test data

Supply voltage	Load		V_{EXT}		
V_{CC}	C_L	R_L [1]	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	$2 \times V_{CC}$

[1] For measuring enable and disable times, $R_L = 5$ kΩ.
 For measuring propagation delays, setup and hold times and pulse width, $R_L = 1$ MΩ.

12. Package outline

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

SOT353-1

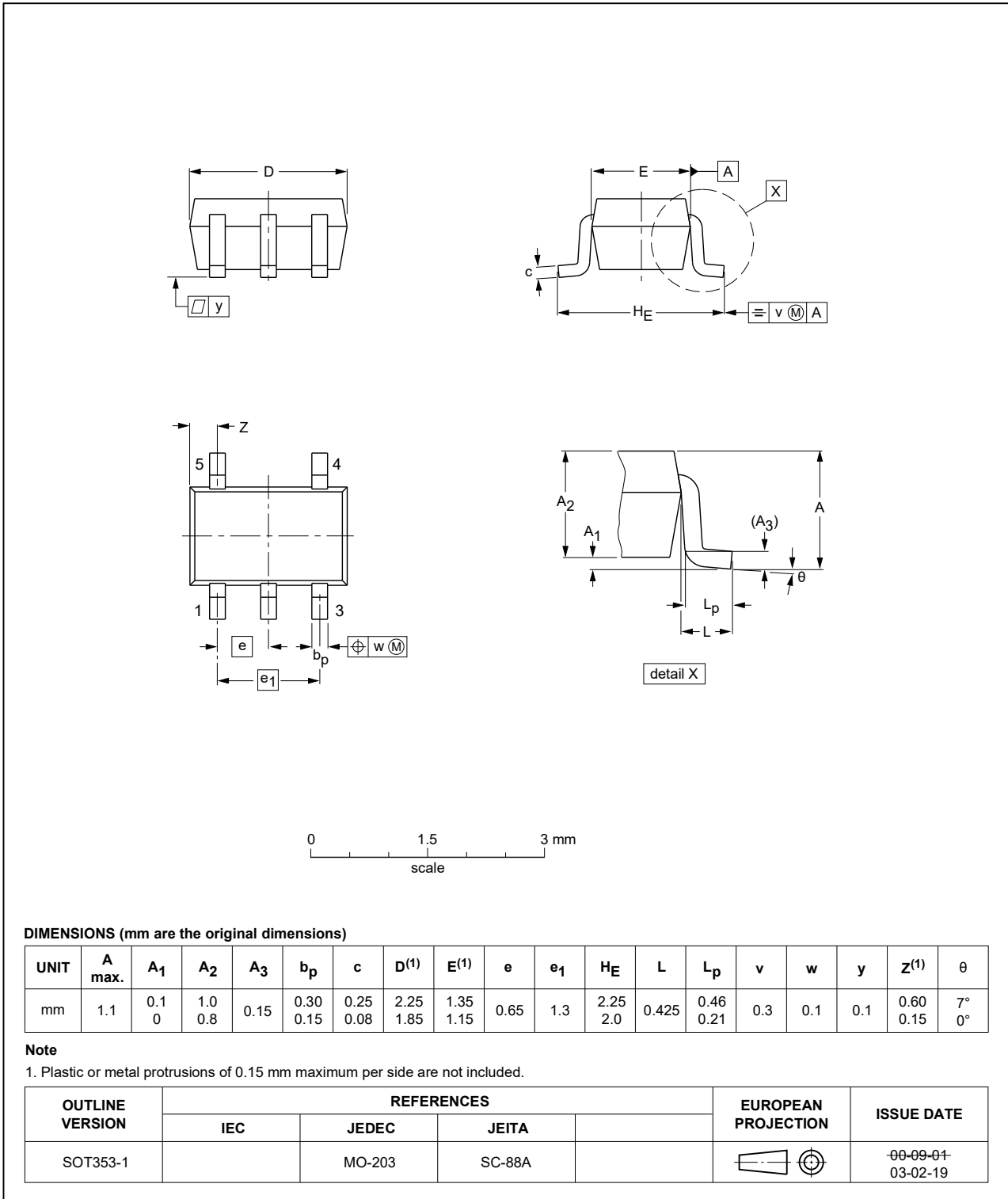


Fig. 7. Package outline SOT353-1 (TSSOP5)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G07_Q100 v.2	20210420	Product data sheet	-	74AUP1G07_Q100 v.1
Modifications:	<ul style="list-style-type: none"> Table 8 and Table 9: Table lay-out aligned with Non-Automotive data sheet 74AUP1G07 and AUP family standard. 			
74AUP1G07_Q100 v.1	20190701	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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