# 74AUP1G00-Q100

# Low-power 2-input NAND gate

Rev. 1 — 4 April 2019

**Product data sheet** 

### 1. General description

The 74AUP1G00-Q100 provides the single 2-input NAND function.

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 JESD22-A114F 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<sub>CC</sub> = 0.9 μA (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<sub>CC</sub>
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation



# 3. Ordering information

#### **Table 1. Ordering information**

Type number	Package	ackage							
	Temperature range	Name	Description	Version					
74AUP1G00GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1					

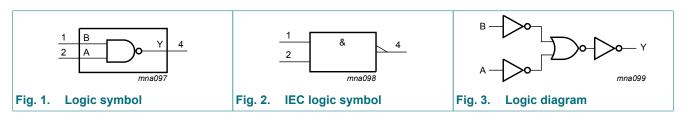
# 4. Marking

#### Table 2. Marking

Type number	Marking code [1]			
74AUP1G00GW-Q100	pA			

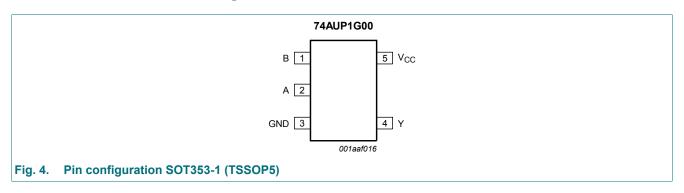
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

# 5. Functional diagram



# 6. Pinning information

### 6.1. Pinning



# 6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
В	1	data input
Α	2	data input
GND	3	ground (0 V)
Υ	4	data output
V <sub>CC</sub>	5	supply voltage

# 7. Functional description

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

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

Input		Output
Α	В	Υ
L	L	Н
L	Н	Н
Н	L	Н
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
$V_{CC}$	supply voltage		-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
VI	input voltage	[1]	-0.5	+4.6	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA
Vo	output voltage	Active mode [1]	-0.5	V <sub>CC</sub> + 0.5	V
		Power-down mode [1]	-0.5	+4.6	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$	-	±20	mA
I <sub>CC</sub>	supply current		-	+50	mA
I <sub>GND</sub>	ground current		-50	-	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 [2]	-	250	mW

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

<sup>[2]</sup> For TSSOP5 packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

# 9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		8.0	3.6	V
VI	input voltage		0	3.6	V
Vo	output voltage	Active mode	0	V <sub>CC</sub>	V
		Power-down mode; V <sub>CC</sub> = 0 V	0	3.6	V
T <sub>amb</sub>	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 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	Тур	Max	Unit
T <sub>amb</sub> = 2	5 °C					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
	HIGH-level input voltag	V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	•	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	$I_{\rm O}$ = -20 $\mu$ A; $V_{\rm CC}$ = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.75V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.11	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.32	-	-	V
		$I_{\rm O}$ = -2.3 mA; $V_{\rm CC}$ = 2.3 V	2.05	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.72	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.6	-	-	V
$V_{CC} = 2.3 \ V \ to \ 2.7 \ V \\ V_{CC} = 3.0 \ V \ to \ 3.6 \ V \\ V_{CC} = 3.0 \ V \ to \ 3.6 \ V \\ V_{CC} = 0.8 \ V \\ V_{CC} = 0.9 \ V \ to \ 1.95 \ V \\ V_{CC} = 2.3 \ V \ to \ 2.7 \ V \\ V_{CC} = 2.3 \ V \ to \ 3.6 \ V \\ V_{CC} = 2.3 \ V \ to \ 3.6 \ V \\ V_{CC} = 3.0 \ V \ to \ 3.6 \ V \\ V_{CC} = 3.0 \ V \ to \ 3.6 \ V \\ V_{CC} = 0.8 \ V \ to \ 3.6 \ V \\ V_{CC} = 0.1 \ V_{CC} = 0.8 \ V \ to \ 3.6 \ V \\ V_{CC} = 0.1 \ $						
	voltage	I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.31	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.31	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.31	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.44	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.31	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.44	V

**Product data sheet** 

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.1	μΑ
I <sub>OFF</sub>	power-off leakage current	$V_{I}$ or $V_{O} = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.2	μΑ
Δl <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.2	μΑ
I <sub>CC</sub>	supply current	$V_{I}$ = GND or $V_{CC}$ ; $I_{O}$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V	-	-	0.5	μΑ
$\Delta I_{CC}$	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$ [1]	-	-	40	μΑ
C <sub>I</sub>	input capacitance	$V_{CC}$ = 0 V to 3.6 V; $V_{I}$ = GND or $V_{CC}$	-	0.8	-	pF
Co	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF
T <sub>amb</sub> = -4	40 °C to +85 °C			1		,
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_{O}$ = -20 $\mu$ A; $V_{CC}$ = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.7V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.03	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.30	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.97	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.85	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.67	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.55	-	-	V
V <sub>OL</sub>	LOW-level output	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.37	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.35	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.33	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.33	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.45	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.5	μA
I <sub>OFF</sub>	power-off leakage current	$V_1 \text{ or } V_0 = 0 \text{ V to } 3.6 \text{ V; } V_{CC} = 0 \text{ V}$	-	-	±0.5	μΑ
Δl <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.6	μΑ
I <sub>CC</sub>	supply current	$V_I$ = GND or $V_{CC}$ ; $I_O$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V	-	-	0.9	μΑ
$\Delta I_{CC}$	additional supply current	$V_1 = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V} $ [1]	-	-	50	μA

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T <sub>amb</sub> = -	40 °C to +125 °C					
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.75V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.70V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		$ \text{tage}  \begin{array}{c} \text{V}_{\text{CC}} = 0.8 \ \text{V} & 0.75 \text{V}_{\text{CC}} & - & - & \text{V} \\ \text{V}_{\text{CC}} = 0.9 \ \text{V} \ \text{to} \ 1.95 \ \text{V} & 0.70 \text{V}_{\text{CC}} & - & - & \text{V} \\ \text{V}_{\text{CC}} = 2.3 \ \text{V} \ \text{to} \ 2.7 \ \text{V} & 1.6 & - & - & \text{V} \\ \text{V}_{\text{CC}} = 3.0 \ \text{V} \ \text{to} \ 3.6 \ \text{V} & 2.0 & - & - & \text{V} \\ \text{V}_{\text{CC}} = 0.8 \ \text{V} & - & - & 0.25 \text{V}_{\text{CC}} \ \text{V} \\ \text{V}_{\text{CC}} = 0.8 \ \text{V} & - & - & 0.30 \text{V}_{\text{CC}} \ \text{V} \\ \text{V}_{\text{CC}} = 2.3 \ \text{V} \ \text{to} \ 1.95 \ \text{V} & - & - & 0.7 \ \text{V} \\ \text{V}_{\text{CC}} = 2.3 \ \text{V} \ \text{to} \ 2.6 \ \text{V} & - & - & 0.7 \ \text{V} \\ \text{V}_{\text{CC}} = 3.0 \ \text{V} \ \text{to} \ 3.6 \ \text{V} & - & - & 0.9 \ \text{V} \\ \text{V}_{\text{CC}} = 3.0 \ \text{V} \ \text{to} \ 3.6 \ \text{V} & - & - & 0.9 \ \text{V} \\ \text{V}_{\text{CC}} = 3.0 \ \text{V} \ \text{to} \ 3.6 \ \text{V} & \text{V}_{\text{CC}} = 0.11 \ \text{V} \\ \text{I}_{\text{O}} = -2.0 \ \mu\text{A}; \ \text{V}_{\text{CC}} = 0.8 \ \text{V} \ \text{to} \ 3.6 \ \text{V} & \text{V}_{\text{CC}} = 0.11 \ \text{V} \\ \text{I}_{\text{O}} = -1.1 \ \text{mA}; \ \text{V}_{\text{CC}} = 1.1 \ \text{V} & 0.60 \text{V}_{\text{CC}} \\ \text{I}_{\text{O}} = -1.7 \ \text{mA}; \ \text{V}_{\text{CC}} = 1.4 \ \text{V} & 0.93 \ - & - \ \text{V} \\ \text{I}_{\text{O}} = -1.9 \ \text{mA}; \ \text{V}_{\text{CC}} = 1.65 \ \text{V} & 1.17 \ - & - \ \text{V} \\ \text{I}_{\text{O}} = -2.3 \ \text{mA}; \ \text{V}_{\text{CC}} = 2.3 \ \text{V} & 1.67 \ - & - \ \text{V} \\ \text{I}_{\text{O}} = -2.3 \ \text{mA}; \ \text{V}_{\text{CC}} = 2.3 \ \text{V} & 1.67 \ - & - \ \text{V} \\ \text{I}_{\text{O}} = -4.0 \ \text{mA}; \ \text{V}_{\text{CC}} = 3.0 \ \text{V} & 2.30 \ - & - \ \text{V} \\ \text{I}_{\text{O}} = -4.0 \ \text{mA}; \ \text{V}_{\text{CC}} = 3.0 \ \text{V} & - \ - & 0.31 \ \text{V} \\ \text{I}_{\text{O}} = 1.1 \ \text{mA}; \ \text{V}_{\text{CC}} = 1.4 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{CC}} \\ \text{I}_{\text{O}} = 1.1 \ \text{mA}; \ \text{V}_{\text{CC}} = 1.4 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{M}_{\text{O}} = 1.1 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{V} & - \ - & 0.33 \ \text{V}_{\text{C}} \\ \text{I}_{\text{O}} = 1.1 \ \text{V}_{\text{O}} = 1$	V			
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.25V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.30V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	$I_{\rm O}$ = -20 $\mu$ A; $V_{\rm CC}$ = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.11	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.6V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	0.93	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.17	-	-	V
		$I_{O}$ = -2.3 mA; $V_{CC}$ = 2.3 V	1.77	-	-	V
		$I_{O}$ = -3.1 mA; $V_{CC}$ = 2.3 V	1.67	-	-	V
		$I_{O}$ = -2.7 mA; $V_{CC}$ = 3.0 V	2.40	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.30	-	-	V
V <sub>OL</sub>	LOW-level output	$V_I = V_{IH}$ or $V_{IL}$				
	voltage	I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.11	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.33V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.41	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.39	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.36	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.50	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.50	V
l <sub>l</sub>	input leakage current	$V_{I}$ = GND to 3.6 V; $V_{CC}$ = 0 V to 3.6 V	-	-	±0.75	μA
I <sub>OFF</sub>	power-off leakage current	$V_{I}$ or $V_{O} = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.75	μΑ
Δl <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.75	μΑ
I <sub>CC</sub>	supply current	$V_{I}$ = GND or $V_{CC}$ ; $I_{O}$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V	-	-	1.4	μΑ
ΔI <sub>CC</sub>	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V} $ [1]	-	-	75	μA

<sup>[1]</sup> One input at  $V_{CC}$  - 0.6 V, other input at  $V_{CC}$  or GND.

# 11. Dynamic characteristics

#### **Table 8. Dynamic characteristics**

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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
T <sub>amb</sub> = 2	25 °C; C <sub>L</sub> = 5 pF					
t <sub>pd</sub>	propagation delay	A, B to Y; see <u>Fig. 5</u> [2]				
		V <sub>CC</sub> = 0.8 V	-	17.5	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.5	5.3	11.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.0	3.8	6.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.6	3.1	5.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.3	2.5	4.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.2	3.6	ns
T <sub>amb</sub> = 2	25 °C; C <sub>L</sub> = 10 pF					
t <sub>pd</sub>	propagation delay	A, B to Y; see <u>Fig. 5</u> [2]				
		V <sub>CC</sub> = 0.8 V	-	21.0	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.4	6.1	13.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.4	4.4	7.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	3.7	6.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.4	3.0	4.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.3	2.8	4.3	ns
T <sub>amb</sub> = 2	25 °C; C <sub>L</sub> = 15 pF					<u> </u>
t <sub>pd</sub>	propagation delay	A, B to Y; see <u>Fig. 5</u> [2]				
		V <sub>CC</sub> = 0.8 V	-	24.5	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.4	6.9	14.8	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.8	5.0	8.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	4.1	7.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	3.5	5.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.6	3.2	4.9	ns
T <sub>amb</sub> = 2	25 °C; C <sub>L</sub> = 30 pF					
t <sub>pd</sub>	propagation delay	A, B to Y; see <u>Fig. 5</u> [2]				
		V <sub>CC</sub> = 0.8 V	-	34.8	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	4.6	9.2	20.1	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.0	6.5	11.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.6	5.4	9.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.4	4.6	7.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.3	4.3	6.5	ns

Symbol	Parameter	Conditions		Min	Typ [1]	Max	Unit
T <sub>amb</sub> = 2	5 °C						
C <sub>PD</sub>	power dissipation	$f = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	[3]				
	capacitance	V <sub>CC</sub> = 0.8 V		-	2.6	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V		-	2.8	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V		-	2.9	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V		-	3.1	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V		-	3.6	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V		-	4.2	-	pF

- [1] All typical values are measured at nominal  $V_{CC}$ .
- $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).  $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$  where:

 $f_i$  = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$  = sum of the outputs.

#### **Table 9. 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	Max	Min	Max	
C <sub>L</sub> = 5 p	F		'					'
t <sub>pd</sub>	propagation delay	A, B to Y; see Fig. 5	[1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V		2.1	12.2	2.1	13.5	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V		1.8	7.8	1.8	8.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		1.4	6.2	1.4	6.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		1.1	4.7	1.1	5.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.0	4.2	1.0	4.7	ns
C <sub>L</sub> = 10	pF				1	I		
t <sub>pd</sub>	propagation delay	A, B to Y; see Fig. 5	[1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V		2.2	14.4	2.2	15.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V		2.2	9.2	2.2	10.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		1.9	7.3	1.9	8.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		1.3	5.6	1.3	6.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.2	4.9	1.2	5.4	ns
C <sub>L</sub> = 15	pF					I		
t <sub>pd</sub>	propagation delay	A, B to Y; see Fig. 5	[1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V		3.1	16.5	3.1	18.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V		2.5	10.5	2.5	11.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V		2.0	8.3	2.0	9.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V		1.5	6.4	1.5	7.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V		1.4	5.7	1.4	6.3	ns

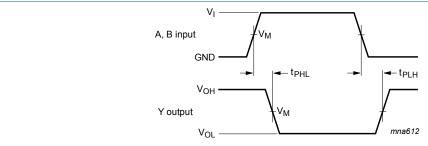
**Product data sheet** 

Symbol	Parameter	Conditions	-40 °C t	o +85 °C	-40 °C to	Unit	
			Min	Max	Min	Max	
C <sub>L</sub> = 30	pF						
t <sub>pd</sub>	propagation delay	A, B to Y; see <u>Fig. 5</u> [1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V	4.1	22.6	4.1	24.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.9	14.0	2.9	15.4	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.3	11.1	2.3	12.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	8.5	2.1	9.4	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.1	7.6	2.1	8.4	ns

<sup>[1]</sup>  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

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#### 11.1. Waveforms and test circuit



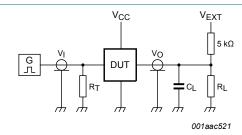
Measurement points are given in Table 10.

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

Fig. 5. The data input (A or B) to output (Y) propagation delays

Table 10. Measurement points

Supply voltage	Output			
V <sub>CC</sub>	V <sub>M</sub>	V <sub>I</sub>	$t_r = t_f$	$V_{M}$
0.8 V to 3.6 V	0.5 × V <sub>CC</sub>	V <sub>CC</sub>	≤ 3.0 ns	0.5 × V <sub>CC</sub>



Test data is given in Table 11.

Definitions for test circuit:

R<sub>L</sub> = 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 11. Test data

Supply voltage	Load		V <sub>EXT</sub>			
V <sub>CC</sub>	CL	R <sub>L</sub> [1]	t <sub>PLH</sub> , t <sub>PHL</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>	
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	2 × V <sub>CC</sub>	

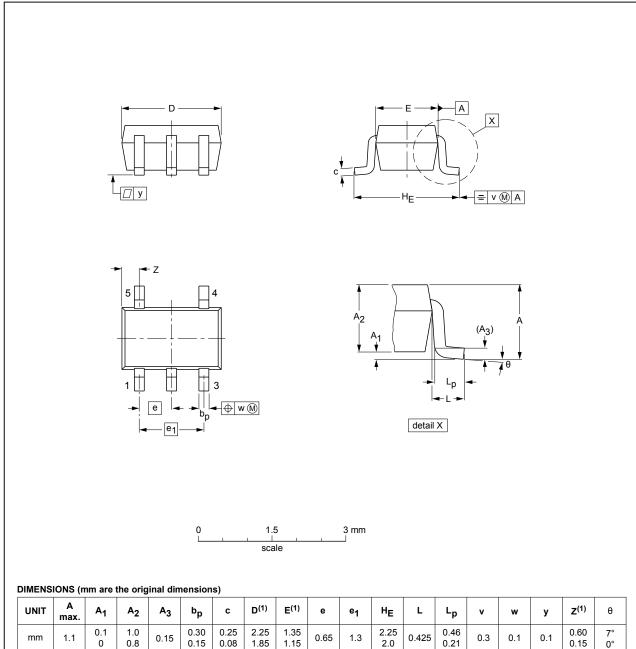
[1] For measuring enable and disable times  $R_L = 5 \text{ k}\Omega$ . For measuring propagation delays, setup and hold times and pulse width  $R_L = 1 \text{ M}\Omega$ .

**Product data sheet** 

# 12. Package outline

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

SOT353-1



UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	bp	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	e <sub>1</sub>	HE	L	Lp	v	w	у	Z <sup>(1)</sup>	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE			
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE	
SOT353-1		MO-203	SC-88A			<del>-00-09-01</del> 03-02-19	

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

**Product data sheet** 

# 13. Abbreviations

#### **Table 12. Abbreviations**

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

# 14. Revision history

#### **Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G00_Q100 v.1	20190404	Product data sheet	-	-

**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.

- Please consult the most recently issued document before initiating or completing a design.
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Product data sheet

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